

'ANALAR' STANDARDS

for

LABORATORY CHEMICALS

Formulated and issued jointly by
THE BRITISH DRUG HOUSES LTD.

and

HOPKIN & WILLIAMS LTD.

LONDON

1949

First Edition September 1934

Second Edition February 1937

Third Edition January 1944

Reprinted June 1946

Fourth Edition (revised and enlarged) 1949

CONTENTS

	PAGE
PREFACE TO FOURTH EDITION	v vii
FOREWORD TO FIRST EDITION	ix x
PREFACE TO FIRST EDITION	xi-xiii
EXPLANATORY NOTES	xiv-xviii
'ANALAR' STANDARDS	1-283
APPENDIX 1	284
(a) Reagents Used in Testing ANALAR Chemicals	284-288
(b) Indicator Solutions	288-289
(c) Standard Solutions	289-291
APPENDIX 2 Preparation of Standard Comparison Solutions	291-292
APPENDIX 3 The Limit Test for Water	292-293
APPENDIX 4 The Limit Test for Arsenic	293-294
APPENDIX 5 Electrodeposition of Metals	294
"ANALOID'S"	295-296
INTERNATIONAL ATOMIC WEIGHTS	297
INDEX	299-302

NOTE

'AnalaR' is a registered trade mark and is the joint property of The British Drug Houses Ltd and Hopkin & Williams Ltd. The specifications published in this volume are the joint copyright of the two Companies. Each Company, however, produces and markets 'AnalaR' chemicals independently.

PREFACE TO THE FOURTH EDITION

For the present edition the book of 'AnalaR' standards has undergone the greatest enlargement and the most thorough revision since its first publication in 1934. Specifications for fifty-eight new 'AnalaR' chemicals are included. Some of these constitute simply an extension of the existing range while others have been selected in accordance with two definite objectives. In the first place it was considered desirable to introduce a fairly liberal selection of organic chemical reagents which fall generally into two sub-classifications—(a) reagents for inorganic analysis, including the detection and determination by gravimetric, colorimetric or other means of both metals and acid radicals, and (b) reagents for the identification of organic substances by the formation of derivatives of definite melting-points. It has been shown repeatedly that impure reagents, particularly in class (a), can give rise to errors and difficulties altogether out of proportion to the actual amount of impurity present, and the need for a definite standard of purity is well established. In the second place it was considered that a useful purpose would be served if the 'AnalaR' range were made to include at least one compound of each of the more common elements, the range having been rather restricted, hitherto, from this point of view. This policy has been put into effect so far as seems reasonable and so far as suitable compounds can be made available. The items that have served for the introduction of additional elements are marked with an asterisk in the list of additions that follows.

Ammonium bromide	Digitonin
Ammonium dichromate	Dioxan
Ammonium formate	3,5-Dinitrobenzoyl chloride
Benzaldehyde	2,4-Dinitrophenylhydrazine
α -Benzoin oxime	Diphenylbenzidine
Benzyl iso thiourea	5 <i>m</i> Diphenylcarbazide
hydrochloride	Diphenylthiocarbazone
*Beryllium sulphate	$\alpha\alpha$ -Dipyridyl
Bismuth nitrate	Ethyl cyanoacetate
<i>n</i> -Butyl alcohol	Indigo carmine
iso-Butyl alcohol	Iodine pentoxide
Cadmium acetate	Iodine trichloride
Cadmium chloride	7 Iodo 8 hydroxyquinoline 5-
*Cæsium chloride	sulphonic acid
Calcium sulphate	Isatin
*Ceric ammonium nitrate	*Lithium sulphate
1-Chloro 2,4 dinitrobenzene	<i>p</i> Nitrobenzoyl chloride
Chromium chloride	Nitron
Cupferron	<i>o</i> -Phenanthroline

Phosphorus pentachloride	*Strontium chloride
Pyrogallol	*Telluric acid
Salicylaldehyde	*Thallium sulphate
*Selenium	*Thorium nitrate
Semicarbazide hydrochloride	*Titanyl potassium oxalate
Silver sulphate	<i>o</i> -Tolidine
Sodium arsenate	<i>p</i> -Toluidine
Sodium diethyldithiocarbamate	Triketohydrindene hydrate
Sodium hydrogen tartrate	Urea
Sodium pyrophosphate	Zinc acetate
*Sodium selenate	Zinc powder

Only one 'AnalaR' chemical has been discontinued in the present edition. This is Ferric Chloride Anhydrous. The difficulty of preparing a satisfactory product, the unstable nature of the substance, and the very small demand for such a high quality, have contributed to this decision.

All the previously existing specifications have been critically reviewed and many have been materially revised both in the light of progress in analytical chemistry and under the guidance of our experience of users' requirements. A large number of additional tests will be found and many old tests are replaced by more modern techniques. Certain improvements of more or less general nature appear worthy of specific mention.

Specific solubility tests have been incorporated in almost every monograph. Refractive index tolerances have been included for most of the organic liquids. Following the modern trend specific gravities at 15.5°/15.5° have been replaced by weights per millilitre at 20°. For the lower alcohols, however, the older expression has been retained because the whole system of determination and dilution in current use is based upon tables that employ it.

Assays are now given for a greater number of chemicals and newer methods have been introduced wherever appropriate.

The technique of electrolytic deposition has been adopted for two distinct purposes: for the assay of certain metallic salts and for the removal of the principal metal from such salts so that traces of alkalis and alkaline earths may be determined by the evaporation of the resulting solution. These impurities were previously isolated by precipitating the heavier metal as the hydroxide or sulphide and there can be no doubt that a considerable proportion of the impurity was carried down by the precipitate. Wherever possible a single deposition has been made to serve both for the assay and for the test for alkalis.

In the iron salts alkalis are now determined after removal of the iron by an extraction method. Certain impurities can be determined most expediently and accurately by the use of the polarograph and no better

reason seems necessary for the introduction of that instrument, it has, therefore, been applied to the determination of nickel in cobalt salts, of lead in copper, of copper, zinc and lead in ferrous sulphate and of zinc in potassium and sodium hydroxides. An extension of polarographic methods is anticipated for the future.

The Karl Fischer technique for the determination of water is the first real answer to a long-standing problem of the greatest importance, and the method is now adopted in the specifications for all organic liquids amenable to this technique. The literature relating to the determination of moisture in acetone by the Karl Fischer method is conflicting and in our own experience erratic results are obtained. The procedure has, therefore, not been applied to this substance.

We have found it desirable to separate most of the phosphate and silicate tests that were previously carried out by the one reaction with the molybdate reagent. Certain ions, unavoidably present, were found to have diverse effects upon the reactions of the two impurities and the relative sensitivities did not always correspond with suitable limits. In some cases the silicate figure appeared only incidentally and has been omitted in the new system. On the other hand phosphate and silicate tests have been added to the specifications for the alkali carbonates and bicarbonates and the caustic alkalis.

The introduction of new methods of greater sensitivity and greater accuracy occasionally shows that the figure previously quoted as the maximum limit of the impurity, though the most accurate in its time according to the means then available for its determination, was under-estimated. Where these circumstances have been discovered it has been possible in some cases to compensate by an improvement in the quality of the chemical and thus make it possible to retain the lower figure for the limit. In other instances this has not been immediately possible and an increased figure has been given, though it must be emphasized that the material now supplied is at least equal in purity to that issued under the older standards. This is the case with respect to the nickel content of cobalt salts. It is felt that these circumstances lend considerable support to the view, always held by the compilers of 'AnalaR' Standards, that the quantitative expression of maximum limits or of 'actual batch analyses' can be safely interpreted only with reference to a specified method of testing.

THE BRITISH DRUG HOUSES LTD
HOPKIN AND WILLIAMS LTD

January 1949

FOREWORD TO THE FIRST EDITION

By the late Professor Jocelyn F Thorpe, C B E, Ph D, D Sc, F R S,
one time Professor of Organic Chemistry in the University of London
(Imperial College)

THERE was a time, prior to 1914, when those who worked in chemical laboratories found that the only means by which they could rely on the purity and homogeneity of their reagents and research materials depended on the reputations of a few well-known firms. Even so, the consumer had in several instances to redistil or recrystallise the initial material he proposed to use before he could be certain that it possessed the necessary degree of 'purity' for his purpose. For the term 'purity' is merely relative and can never be absolute, hence the necessity for some criterion of 'purity' which will give the user the information he requires. The statement that unreliable material yields unreliable results needs no emphasis. Many research chemists have experienced the bitter disappointment caused by the discovery that the work of many months has been rendered useless by the presence of some 'alien' substance in the material used. The writer remembers that on one occasion the presence of phosphorus trichloride in a specimen of acetyl chloride obtained from a well-known continental firm led to results which took some two months to explain, and many research chemists must have had similar experiences.

There are only two ways in which the consumer can be protected against the unscrupulous dealer or trader, either a specific standard must be enforced as is the case with foodstuffs, etc., or the 'purity' of the material must carry with it the guarantee of some firm or combination of firms of high standing whose reputations are bound up in the guarantee, and who are prepared to inform the consumer exactly what is meant by the word 'purity'.

The former method implies the policeman, and is one which Authority alone can apply effectively. It is, moreover, one which Authority is not likely to apply unless the well-being of the public generally is concerned. In the latter method the need for the policeman is replaced by the reputation of the firm or firms supplying the materials, which acts as a safeguard against any lowering of the standard desired and required by the consumer. It was, therefore, under the latter method that those who controlled laboratories and research schools worked in pre war times.

Then came the war and everything was changed. It soon became apparent that the number of reagents and research chemicals actually

manufactured in this country was exceedingly meagre, and that most of them had been obtained from the continent. The continental spring having ceased to flow, the accumulated stocks in this country gradually diminished or became localised until a highly serious situation arose. As a temporary measure we at the Imperial College, South Kensington, founded an Exchange Bureau through which Institutions having large quantities of certain substances could barter them for others of which they might stand in urgent need. At the same time the quantity of available materials was increased by the preparation, by laboratory methods, of those substances for which there seemed to be the greatest demand. This method enabled us to tide over a difficult period, but it was obviously totally inadequate to meet the requirements of the situation. Fortunately British manufacturers soon began to provide the required materials in the necessary quantities and as is mentioned in more detail in the general historical introduction which follows this Foreword, the question of purity was met by the adoption of the letters 'A R' 'A R' meant 'Analytical Reagent', but to my mind it also meant 'All Right'. As a war measure the scheme served its purpose, but, afterwards it failed because it did not fall into either of the categories mentioned above. It had neither the support of Authority nor the backing of reputation. In consequence it was made use of by all and sundry to denote materials of varying degrees of purity, and the letters 'A R' soon ceased to have any real significance.

It is, therefore, with the greatest pleasure, as well as pleasurable anticipation, that I learn from the book of which this is the Foreword that The British Drug Houses and Hopkin & Williams have agreed to issue Laboratory Chemicals of guaranteed 'purity' bearing the registered name 'ANALAR' which will serve as a guarantee based on the great reputation enjoyed by these well known firms.

The book deals with some 200 substances, and in each case the physical and chemical properties are given in order that the degree of 'purity' attained may be indicated. In itself, apart from this, the book is a valuable record of the chief properties of the substances with which it deals. It is understood that further compounds will be added as circumstances require.

All users will wish the compilers every success in their new enterprise.

JOCELYN THORPE

7th 1934

PREFACE TO THE FIRST EDITION

THE first handbook describing definite tests and standards of purity for chemical reagents would appear to have been *Die Prüfung der chemischen Reagentien auf Reinheit* by C Krauch, published in Germany in 1888. The publication of this volume was later taken over by the firm of E Merck, the latest edition of whose work was issued in 1931. An English translation of Krauch's book was made by J A Williamson (then chief chemist to Baird & Tatlock [London] Ltd) and L W Dupre in 1902, but the manufacture of reagents conforming to these specifications of purity remained in German hands.

In 1914, the supply of German laboratory chemicals being cut off, a joint committee appointed by the Institute of Chemistry and the Society of Public Analysts drew up specifications of purity, to which they applied the letters 'A R' signifying 'Analytical Reagent', a designation which has since become well known throughout the British Empire by all users of pure chemicals for scientific purposes. The number of specifications originally issued by the joint committee in 1915 was 88.

There was, however, already available in this country a book of specifications entitled *Analytical Reagents Standards and Tests*, compiled by Edmund White and published in 1911 by Hopkin & Williams Ltd, who had been for many years manufacturing and marketing chemicals complying with these tests. This book contained monographs relating to 137 substances. It was reprinted in 1916, a second edition was published in 1925, and a third edition in 1931.

The war time need for British laboratory chemicals (including analytical reagents) was met by the strenuous efforts of the two firms most directly concerned. Hopkin & Williams Ltd continued to manufacture both to their own and to the 'A R' specifications, while The British Drug Houses Ltd opened up a special department for the manufacture of laboratory chemicals. As a result an adequate supply of these chemicals was soon ensured to workers in this country.

In 1925 the B D H approached the two official bodies responsible for the 'A R' specifications with the suggestion that the specifications should be revised and extended, but their reply was that their action had been a war emergency measure and that they did not wish to take any further part in this work. The B D H then proposed that they should themselves carry out the work, and this they did with the consent and approval of

the Institute of Chemistry and the Society of Public Analysts. This resulted in the publication, in January 1926, of *The B.D.H. Book of 'A.R.' Standards* containing 158 specifications with a prefatory note which had been submitted to and approved by the Councils of the two bodies mentioned. Meanwhile Hopkin & Williams Ltd. had in 1925 issued a revised edition of their book containing 144 specifications.

Subsequently the specifications of both firms have been further revised and extended in the light of increased experience and greater knowledge, while the standard of purity has been considerably raised. Thus, in 1931, Hopkin & Williams published the third edition of their book containing 178 monographs, prepared and issued in collaboration with Baird & Tatlock (London) Ltd., who had been themselves producing analytical reagents for some ten years. In 1932 the B.D.H. published the second edition of their book, which contained, in addition to revised monographs for the 158 chemicals in the first edition, new monographs for 50 other substances, making a total of 208.

The specifications published by the two firms, although on similar lines, were not identical and this occasionally led to misunderstanding on the part of users of laboratory chemicals. Of much greater moment, however, was the increasing evidence that the letters 'A.R.' were being brought into disrepute by the action of some firms in (a) applying them indiscriminately to substances in respect of which no specification existed, and (b) issuing chemicals labelled 'A.R.' which did not conform to the published specifications. Professional chemists, Universities, public bodies and in fact all critical users of laboratory chemicals, felt that the designation 'A.R.' was losing the value which at one time made the term synonymous with purity and reliability, so that in merely specifying 'A.R.' they could no longer rely upon getting material of the requisite degree of purity.

Accordingly it seemed desirable that the B.D.H. and Hopkin & Williams should undertake the unification of their respective series of specifications, so that a definite standard of purity should be available in this country. This project has been carried out during the past year by co-operation between the chemists of the two firms, in the course of which there has been conducted an extensive investigation into the technique of detecting minimal quantities of impurities. The outcome of this collaboration is the publication of the present book, the two firms being the joint owners of the copyright therein. The work contains 220 specifications, and is published under the title

'AnalaR' Standards for Laboratory Chemicals

This book provides chemists with a revised and up to date series of specifications for laboratory chemicals which are sold by, and carry the

guarantee of, both firms under the trade mark 'AnalaR'. In the preparation of the specifications full advantage has been taken of recent advances in analytical practice, and many new and delicate tests have been devised. Some of the former 'A R' specifications have been made more stringent, others have been more accurately defined.

The word 'AnalaR' was chosen as a new designation to replace the letters 'A R', which, for the reasons already indicated, it was considered desirable to discontinue. 'AnalaR' is a registered trade mark and is the joint property of the two firms. Users of 'AnalaR' chemicals can feel satisfaction and reassurance in the knowledge that the standards of purity are definite and precise, and that all chemicals issued under this designation are guaranteed by the two firms to conform to those standards.

THE BRITISH DRUG HOUSES LTD
HOPKIN & WILLIAMS LTD

September 1934

EXPLANATORY NOTES

Conditions of Testing

The routine examination of reagent chemicals over many years has demonstrated the necessity for standardising the conditions under which limit tests for impurities are carried out. It has been recognised that tests which give satisfactory results in one laboratory may fail in another laboratory owing to slight differences in technique. In order to avoid such differences, particular attention has been paid to the wording of the tests so that only one interpretation can be placed on them.

The details of the tests which have been worked out for the detection of minute traces of certain impurities are described with particular care so that consistent results may be obtained by analysts working independently in different laboratories. The tests do not provide against all possible impurities but do allow for all those that have been found significant in analytical practice.

Types of Tests Employed

Wherever possible, methods have been used for determining the actual amount of impurity present, but in testing chemicals for extremely minute amounts of impurities, it is frequently impossible to specify the amount present as a definite quantitative figure. There is a limiting sensitivity to all tests, and where no reaction for an impurity is obtained, it cannot be stated with certainty that the particular impurity is absent. The limiting values of such tests have been studied and where no reaction is observed, the amount of impurity present is recorded as being less than the minimum amount which under the conditions of the test gives the faintest possible reaction.

The tests for impurities fall into two groups —

- (1) Tests in which the method is sufficiently sensitive to afford a true measure of the quantity of impurity present at, or even below, the limit allowed.
- (2) Tests in which the amount of impurity sought is close to the detectable threshold limit imposed by the sensitivity of the best available method.

In the first group are tests, such as the Gutzeit determination of minute quantities of arsenic in which it is easily possible to obtain quantitative results by matching the result of the experiment with suitable standards. For reasons given elsewhere in these notes however, the

individual monographs refer only to standards which represent the desired limits

The second group embraces tests, typified by the sulphate and chloride tests, which do not lend themselves to quantitative expression, and in these tests the smallest quantities that can be detected under the conditions prescribed have, in most cases, been adopted as the maximum limits of these impurities. In this connection, it is of extreme importance that the conditions of the test be adhered to, as, in many cases, slight variations in technique may make considerable differences in the amount of impurity which can be detected.

Maximum Limits of Impurities

A statement of the maximum limits of impurities will be found in each monograph. The figures that are given are intended to represent the amount of impurity that the test will detect. It must be understood, however, that many tests that depend upon the comparison of opalescences, turbidities and colours are subject to certain errors due to the disturbing effect of the other substances in the solution. For this and similar reasons the figures quoted cannot always be regarded as exact and are subject to revision as the technique for the estimation of very small amounts of impurities becomes more developed. Consequently it must be stated that the standards to which the chemical conforms are those of the actual tests, and the 'maximum limits of impurities' are a rational numerical interpretation of those tests. This, of course, does not imply that the amounts stated are necessarily present in products conforming to the test, but the figures represent the maximum permissible limits. The amounts of impurities present in 'AnalaR' chemicals are usually considerably less than the maximum permissible limits, but this additional refinement is not regarded as being of much practical interest to the user.

The compilers will at all times be grateful for any information from investigators who have specialised knowledge.

Reagent Solutions

The strengths of the reagent solutions employed in the tests are given in the Appendix. As far as possible these are described in terms of normality or as molar solutions, this makes for convenience and simplicity. The dilute acids and dilute alkalis are all approximately 5N, which is a convenient strength for general use, these are always referred to in the test as 'dilute acetic acid', etc. When the word 'dilute' is omitted, it is intended that the concentrated acid should be used.

Time

Where no length of time is stated, a period of 5 minutes should be allowed before observing the result of a test.

Solubility Tests

In a few cases quantitative limits have been laid down for the amount of insoluble matter. In general, it is required that the substance shall give a 'clear solution' when a specified quantity is dissolved in a specified volume of solvent. This is to be interpreted as signifying a reasonably clear solution as observed in the ordinary manner without the aid of special instruments. No solid chemical substance prepared commercially dissolves in a solvent to yield a solution in which particles of dust cannot be detected, if sufficiently refined methods of observation be employed. Usually, the proportion of insoluble matter is so small that a quantitative determination by filtering off and weighing is quite unnecessary.

Tests for Chlorides

The minimum opalescence which it is possible to perceive depends to a large extent on the quality of the light under which the observation is conducted. In many tests the expression 'no opalescence' will be found, this is intended to mean an opalescence less than that produced by the following procedure —

To 50 ml of water add 0.1 ml of standard chloride solution (1 ml = 0.1 mg Cl), 1 ml of dilute nitric acid and 1 ml of silver nitrate solution, mix and observe after 5 minutes.

Tests for Residue

Where large quantities of reagents are used in carrying out a test it may be necessary to apply a correction for the amount of impurity in the reagents. This applies particularly to the tests for alkalis and other metals where the metallic radical of the salt is removed by precipitation and the residue obtained on evaporation of the filtrate is ignited and weighed. In some cases it has been found that the residue from the reagents exceeds that from the substance under examination. Further, it must be remembered that a filter paper may contribute to a filtrate soluble matter weighing one milligram or an even larger amount. In order to obviate inaccuracies due to such causes it is essential that certain determinations should be accompanied by blank experiments carried out on the reagents used so that the necessary corrections can be made.

Volumetric Standards

Many substances have been proposed for the purpose of standardising volumetric solutions. As the result of long experience in the laboratories of the joint compilers, it is recommended that the following substances only should be used as primary standards in work of high accuracy

Potassium dichromate
Potassium hydrogen phthalate
Potassium iodate
Sodium carbonate (anhydrous)

Sodium chloride
Sodium oxalate

These are anhydrous salts and they may be dried by heat without change of composition

The chemicals mentioned below are often used for standardising purposes, but they should be looked upon as being secondary standards. Several contain water of crystallisation and consequently are liable to gain or lose moisture in accordance with the humidity of the atmosphere and the care with which they are stored. Such salts cannot be dried immediately before use and consequently must be stored in well closed containers

Antimony potassium tartrate
Arsenious oxide
Benzoic acid
Ferrous ammonium sulphate
Guanidine carbonate
Hydrazine sulphate
Oxalic acid
Potassium hydrogen tartrate
Silver nitrate
Sodium borate

Chemicals for Buffer Solutions

The following chemicals, specifications for which are included in this book, are suitable for preparing buffer solutions for use in the determination of hydrogen ion concentration

Acetic acid
Aminoacetic acid
Boric acid
Citric acid
Potassium chloride
Potassium dihydrogen phosphate
Potassium hydrogen phthalate
Potassium tetroxalate
Sodium chloride
Sodium phosphate (anhydrous)

Atomic Weights

International Atomic Weights, 1947, have been used in calculating the molecular weights factors, etc. A table is given on page 297

Temperatures are stated in Centigrade degrees and all tests are conducted at room temperature (15° to 25°) unless otherwise stated

Determinations of Weight per ml and Specific Gravity determinations are based on weighings in air

Bolling Range Tests are carried out in the apparatus and by the method of the British Standard Specification No 658—1936

Melting Points are determined on the freshly dried material which, contained in a suitable tube, is introduced into the heated bath liquid when the latter reaches a temperature approximately 10° below the anticipated melting point. The liquid is heated so as to produce a temperature rise of approximately 2° per minute

Freezing Points are determined by the method described in the Report of the Essential Oil Sub Committee to the Standing Committee on Uniformity of Analytical Methods, *Analyst*, 54, 335 (1929)

It has not been considered possible to acknowledge the many sources of the tests described, distributed as they are through many scientific publications. All have been the subject of extended experiment in the B D H and H & W Analytical Laboratories. Many of the tests are original and others have been modified to suit the particular requirements of the chemical for which they are used

THE BRITISH DRUG HOUSES LTD
HOPKIN & WILLIAMS LTD

'ANALAR' STANDARDS FOR LABORATORY CHEMICALS

ANALAR ACETIC ACID (Glacial)



Maximum Limits of Impurities

Non-volatile Matter	0.001 per cent
Chloride (Cl)	0.0002 per cent
Sulphate (SO_4)	0.0004 per cent
Heavy Metals (Pb)	0.0002 per cent
Iron (Fe)	0.0001 per cent
Bromine absorbed (Br)	0.006 per cent
Oxygen absorbed from Dichromate (O)	0.003 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

- 1 **Description**—A clear colourless liquid with a characteristic odour
- 2 **Solubility**.—Miscible in all proportions with water, and with alcohol, forming clear colourless solutions
- 3 **Freezing Point**—Not below 15.5°
- 4 **Non-volatile Matter**.—Evaporate 50 ml to dryness on a water-bath. Not more than 0.5 mg of residue should be left
- 5 **Chloride**—Dilute 5 ml with 45 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced
- 6 **Sulphate**—To 50 ml add 0.2 ml of N/1 Na_2CO_3 and evaporate to dryness on a water bath. Dissolve the residue in 10 ml of water and 1 ml of N/1 HCl, filter if necessary, and add 1 ml of barium chloride solution. Any turbidity produced should not be greater than the "standard turbidity" defined in appendix 2
- 7 **Heavy Metals and Iron**—Dilute 10 ml with 30 ml of water and add 15 ml of strong ammonia solution, cool and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

ACETIC ACID (Glacial)—continued

8 **Bromine Absorption**—Introduce 20 ml into a 50 ml graduated stoppered flask, add 25 ml of water and 5 ml of an approximately decinormal solution of bromine in glacial acetic acid. Shake and adjust with water to exactly 50 ml. Pipette off immediately 10 ml of this, add 20 ml of water and 5 ml of potassium iodide solution and titrate the liberated iodine with $N/50 \text{ Na}_2\text{S}_2\text{O}_3$ using starch as indicator. Keep the remainder in a dark place at 20° for 1 hour and then titrate a second 10 ml in the same manner. The difference between the two titrations should not exceed 0.15 ml.

9 **Oxygen Absorption**—Mix 10 ml with 1 ml of $N/10 \text{ K}_2\text{Cr}_2\text{O}_7$ and 10 ml of sulphuric acid, cool and allow to stand for 30 minutes, dilute with 50 ml of water, again cool, add 1 ml of potassium iodide solution and titrate the liberated iodine with $N/10 \text{ Na}_2\text{S}_2\text{O}_3$. Not less than 0.6 ml of $N/10 \text{ Na}_2\text{S}_2\text{O}_3$ should be required.

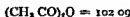
10 **Arsenic**—Dilute 10 ml with 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

11 **Assay**—Dilute 2 to 3 g with 50 ml of water and titrate with $N/1 \text{ NaOH}$ using phenolphthalein as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR ACETIC ANHYDRIDE



Maximum Limits of Impurities

Non-volatile Matter	0.0025 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Phosphorus Compounds (P)	0.0005 per cent
Organic Impurities	passes test

1 **Description**—A clear colourless liquid with a pungent odour.

2 **Solubility**.—Slowly soluble in water with formation of acetic acid. Readily soluble in alcohol and in ether.

3 **Weight per ml at 20°** .—1.075 to 1.085 g

4. **Non-volatile Matter.**—Evaporate 20 ml to dryness on a sand-bath. Not more than 0.5 mg of residue should be left.

5. **Chloride.**—Dissolve 10 ml in 40 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

6. **Sulphate.**—Dissolve 5 ml in 50 ml of water, add 1 ml of barium chloride solution and allow to stand for 18 hours. No turbidity or precipitate should be produced.

7. **Heavy Metals and Iron.**—Dissolve 1 ml in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8. **Phosphorus Compounds.**—Boil 5 ml with 10 ml of water and 5 ml of nitric acid, to the hot solution add 10 ml of ammonium nitromolybdate solution and maintain at about 40° for 2 hours. No yellow precipitate should be produced.

9. **Organic Impurities.**—(a) Dissolve 2 ml in 20 ml of water and add 38 ml of N/1 NaOH. The solution should have no foreign odour.

(b) Boil gently 20 ml with 5 ml of glycerol under a reflux condenser for 1 hour, evaporate off the excess of anhydride, cool, mix with 20 ml of dilute nitric acid and 30 ml of water and allow to stand for 30 minutes. A clear solution free from flocculent matter should be obtained.

10. **Assay.**—Dissolve 2 g in 50 ml of N/1 NaOH, allow to stand for 1 hour and titrate with N/1 HCl using phenolphthalein as indicator.

$$\frac{\text{ml of N/1 NaOH used}}{\text{weight of anhydride}} = a$$

Dissolve a further 2 g in 20 ml of dry benzene, cool in ice, and add a cold solution of 10 ml of dry aniline in 20 ml of dry benzene. Allow to stand for 1 hour, add 50 ml of N/1 NaOH, shake vigorously and titrate with N/1 HCl using phenolphthalein as indicator.

$$\frac{\text{ml of N/1 NaOH used}}{\text{weight of anhydride}} = b$$

then $10.2(a - b)$ = per cent of $(\text{CH}_3\text{CO})_2\text{O}$

Not less than 95 per cent should be indicated.

ANALAR ACETONE



Maximum Limits of Impurities

Acidity	0.1 ml N/1 per cent
Alkalinity	0.1 ml N/1 per cent
Non volatile Matter	0.0025 per cent
Oxygen absorbed (O)	0.0005 per cent
Water	1.0 per cent

- 1 **Description**—A clear colourless liquid with a characteristic odour
- 2 **Solubility**—Miscible in all proportions with water forming clear colourless solutions
- 3 **Acidity**—Dilute 10 ml with 10 ml of carbon dioxide free water, add 0.1 ml of phenolphthalein solution and titrate with N/10 NaOH. Not more than 0.1 ml of N/10 NaOH should be required to produce a pink tint
- 4 **Alkalinity**—Dilute 10 ml with 10 ml of water, add 0.2 ml of methyl red solution and titrate with N/10 HCl. Not more than 0.1 ml of N/10 HCl should be required to produce a red tint
- 5 **Weight per ml at 20°**—0.790 to 0.792 g
- 6 **Refractive Index**— n_D^{20} 1.3580 to 1.3600
- 7 **Boiling Range**—Not less than 95 per cent should distil between 56.0° and 56.5°
- 8 **Non-volatile Matter**—Evaporate 50 ml to dryness on a water bath. Not more than 1 mg of residue should be left
- 9 **Oxygen Absorption**—To 20 ml add 0.1 ml of N/10 KMnO_4 and allow to stand for 15 minutes. The pink colour should not entirely disappear
- 10 **Water**—To 2 ml add 10 ml of carbon disulphide. A clear solution should be produced

ANALAR ACETYL BROMIDE



Maximum Limits of Impurities

Non volatile Matter	0.01 per cent
Sulphate (SO_4)	0.002 per cent
Phosphorus Compounds (P)	0.0025 per cent

- 1 **Description**—A clear colourless or slightly yellow liquid. The

product as issued contains small amounts of acetic and hydrobromic acids

2 Solubility—Decomposed by water with formation of acetic and hydrobromic acids

3 Non volatile Matter—Evaporate 10 ml to dryness on a water bath Not more than 1 mg of residue should be left

4 Sulphate—Dissolve 5 ml in 50 ml of water add 1 ml of barium chloride solution and allow to stand for 1 hour No turbidity or precipitate should be produced

5 Phosphorus Compounds—Treat 1 ml cautiously with 1 ml of water add 1 ml of nitric acid boil cool add 20 ml of water and 10 ml of ammonium nitro molybdate solution and maintain at about 40° for 2 hours No yellow precipitate should be produced

6 Assay—Dissolve 1 g in 50 ml of N/1 NaOH and titrate with N/1 H₂SO₄ using phenolphthalein as indicator

1 ml N/1 NaOH = 0.06148 g CH₃COBr

Not less than 97.5 per cent should be indicated

Dilute the neutralised liquid with water to produce 250 ml and titrate 50 ml of this with N/10 AgNO₃ using potassium chromate as indicator

1 ml N/10 AgNO₃ = 0.0123 g CH₃COBr

Not less than 97.5 per cent should be indicated

ANALAR ACETYL CHLORIDE

CH₃COCl = 78.50

Maximum Limits of Impurities

Non volatile Matter	0.01 per cent
Sulphate (SO ₄)	0.002 per cent
Phosphorus Compounds (P)	0.0025 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent

1 Description—A clear liquid colourless or not more than very slightly yellow The product as issued contains small amounts of acetic and hydrochloric acids

2 Solubility—Decomposed by water with formation of acetic and hydrochloric acids and forming a clear colourless solution

3 Boiling Range—Not less than 95 per cent should distil between 50° and 52°

4 Non volatile Matter—Evaporate 10 ml to dryness on a water bath Not more than 1 mg of residue should be left

(Continued overleaf)

ACETYL CHLORIDE—continued

5 **Sulphate.**—Dissolve 5 ml in 50 ml of water, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Phosphorus Compounds.**—Treat 1 ml cautiously with 1 ml of water, add 1 ml of nitric acid, boil, cool, add 20 ml of water and 10 ml of ammonium nitro molybdate solution and maintain at about 40° for 2 hours. No yellow precipitate should be produced.

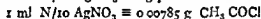
7 **Heavy Metals and Iron.**—Dissolve 2 ml in 35 ml of water, add 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8 **Assay.**—Dissolve 1 g in 50 ml of N/1 NaOH and titrate with N/1 H₂SO₄ using phenolphthalein as indicator.

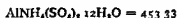


Not less than 98 per cent should be indicated.

Dilute the neutralised liquid with water to produce 250 ml and titrate 50 ml of this with N/10 AgNO₃ using potassium chromate as indicator.



Not less than 98 per cent should be indicated.

ANALAR**ALUMINIUM AMMONIUM SULPHATE
(Ammonium Alum)****Maximum Limits of Impurities**

Chloride (Cl)	0.004 per cent
Heavy Metals (Pb)	0.004 per cent
Iron (Fe)	0.001 per cent
Alkalis and Alkaline Earths (Na)	0.03 per cent

1 **Description.**—Colourless crystals or a crystalline powder.

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride.**—Dissolve 2.5 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 **Heavy Metals.**—Dissolve 0.5 g in 50 ml of water, add 2 ml of sodium hydroxide solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

5 Iron.—Dissolve 1 g in 10 ml of water and 1 ml of dilute hydrochloric acid and add 1 drop of N/10 KMnO_4 , mix add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

6 Alkalis and Alkaline Earths—Dissolve 5 g in 100 ml of hot water, add 10 ml of dilute ammonia solution boil gently for 2 minutes and filter. Evaporate 55 ml of the filtrate to dryness and ignite the residue gently. Not more than 2.5 mg should be obtained

7 Assay.—Dissolve 2.5 g in 250 ml of water, add 2 g of ammonium chloride and heat to boiling. Add a slight excess of dilute ammonia solution, boil gently for 3 minutes, allow to stand for 10 minutes, filter, wash with water, ignite at 1100° and weigh

Weight of $\text{Al}_2\text{O}_3 \times 8.894 = \text{weight of } \text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

Not less than 99.5 per cent should be indicated

ANALAR ALUMINIUM OXIDE (Calcined)

$\text{Al}_2\text{O}_3 = 101.94$

Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Iron (Fe)	0.01 per cent
Loss on Ignition	1.0 per cent

1. Description.—A dull white powder

2 Solubility.—Insoluble in water and in dilute acids. Partially soluble in sodium hydroxide solution

3 Chloride.—Boil 2 g with 50 ml. of water and 1 ml of dilute nitric acid, cool and filter and to the filtrate add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

4 Sulphate—Boil 1 g with 50 ml of water and 1 ml of dilute hydrochloric acid, cool and filter and to the filtrate add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 Iron.—Boil 0.1 g with 10 ml of water and 1 ml of dilute hydrochloric acid, cool and filter, to the filtrate add 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture

(Continued overleaf)

ALUMINIUM SULPHATE—continued

red as indicator Not less than 9.4 ml of N/10 NaOH should be required

8 Assay—Dissolve 1.5 g in 250 ml of water, add 2 g of ammonium chloride and heat to boiling Add a slight excess of dilute ammonia solution, boil gently for 3 minutes, allow to stand for 10 minutes, filter, wash with water, ignite at 1100° and weigh

$$\text{Weight of Al}_2\text{O}_3 \times 3.358 = \text{weight of Al}_2(\text{SO}_4)_3$$

Not less than 51.0 per cent and not more than 54.5 per cent should be indicated

ANALAR AMINOACETIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO ₄)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Ammonia (NH ₃)	0.005 per cent

1 Description—A white crystalline powder

2 Solubility—Dissolve 5 g in 50 ml of water A clear colourless solution should be produced

3 Reaction—Dissolve 1 g in 100 ml of carbon dioxide free water To 50 ml of the solution add 0.1 ml of N/10 NaOH, the pH of the resulting solution should not be less than 6.5 To the other 50 ml of the solution add 0.1 ml of N/10 HCl, the pH of the resulting solution should not be greater than 5.5 Use bromocresol purple as indicator in both tests

4 Sulphated Ash—Moisten 2 g with sulphuric acid and ignite gently Not more than 1 mg of residue should be left

5 Chloride—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution No opalescence should be produced

6 Sulphate—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour No turbidity or precipitate should be produced

7 Heavy Metals and Iron—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through

the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

8 Ammonia—Dissolve 1 g in 45 ml of water, add 5 ml of sodium hydroxide solution and distil 15 ml. To the distillate add 35 ml of water and 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 5 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

9 Assay—Digest 0.3 g with 10 ml of sulphuric acid in a Kjeldahl flask until colourless, cool, add 150 ml of water and 100 ml of sodium hydroxide solution, distil the liberated ammonia and collect it in 50 ml of N/10 HCl. Titrate the excess of acid with N/10 NaOH using methyl red as indicator

$$1 \text{ ml N/10 HCl} \equiv 0.007507 \text{ g NH}_2\text{CH}_2\text{COOH}$$

* Not less than 99 per cent should be indicated

ANALAR AMMONIA SOLUTION

(about 35 per cent NH_3)

$$\text{NH}_3 = 17.03$$

Maximum Limits of Impurities

Non-volatile Matter	0.002	per cent
Chloride (Cl)	0.0001	per cent
Sulphate (SO_4)	0.0005	per cent
Sulphide	passes test	
Phosphate (PO_4)	0.0002	per cent
Silicate (SiO_2)	0.001	per cent
Carbonate (CO_3)	0.003	per cent
Heavy Metals (Pb)	0.00002	per cent
Iron (Fe)	0.00001	per cent
Tarry Matter	passes test	
Oxygen absorbed (O)	0.0008	per cent
Arsenic (As_2O_3)	0.000005	per cent
(0.05 part per million)		

1 Description—A clear colourless liquid with a strong pungent odour

2 Specific Gravity.—About 0.880

3 Non-volatile Matter—Evaporate 100 ml to dryness on a water bath. Not more than 2 mg of residue should be left

4 Chloride—Evaporate 10 ml on a water bath until reduced to 1 ml, dilute with 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

(Continued overleaf)

ANALAR AMMONIUM BICARBONATE



Maximum Limits of Impurities

Non volatile Matter	0.01	per cent
Chloride (Cl)	0.0002	per cent
Sulphate (SO ₄)	0.002	per cent
Heavy Metals (Pb)	0.0002	per cent
Iron (Fe)	0.0001	per cent
Tarry Matter	no reaction	
Arsenic (As ₂ O ₃)	0.00002	per cent
	(0.2 part per million)	

1 Description—Colourless crystals or a white powder with a slight ammoniacal odour

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Non volatile Matter—Heat 10 g gently until the greater part is volatilised, add 2 drops of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

4 Chloride—Boil 5 g with 50 ml of water until the volume is reduced to 5 ml, add 45 ml of water, 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

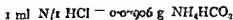
5 Sulphate—Boil 5 g with 50 ml of water until the volume is reduced to 5 ml, add 45 ml of water, 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 Heavy Metals and Iron—Boil 10 g with 50 ml of water until the volume is reduced to 5 ml, add 5 ml of dilute hydrochloric acid, 30 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2

7 Tarry Matter—Treat 5 g with 15 ml of water and 5 g of citric acid and stir until dissolved. No tarry odour should be perceptible

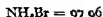
8 Arsenic—Boil 10 g with 50 ml of water until the volume is reduced to 5 ml, add 45 ml of water and 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain

9 Assay—Dissolve 3 g in 50 ml of N/1 HCl and 50 ml of water and titrate the excess of acid with N/1 NaOH using methyl red as indicator



Not less than 99 per cent and not more than 101 per cent should be indicated

ANALAR AMMONIUM BROMIDE



Maximum Limits of Impurities

Reaction	pH not less than 4.5
Non volatile Matter	0.01 per cent
Chloride (Cl)	0.25 per cent
Bromate (BrO_3)	0.001 per cent
Iodide (I)	0.05 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Ph)	0.0005 per cent
Iron (Fe)	0.00025 per cent
Moisture	0.5 per cent

- 1 **Description**—A white crystalline powder
- 2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.
- 3 **Reaction**—The reaction of a solution of 1 g in 10 ml of carbon dioxide free water should not be less than pH 4.5 using bromocresol green as indicator.
- 4 **Non-volatile Matter**—Heat 10 g very gently until the greater part has volatilised. add a few drops of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.
- 5 **Chloride**—Dissolve 4 g in 75 ml of water and 25 ml of nitric acid. boil gently and pass a current of halogen free air through the liquid until all the liberated bromine is removed. Cool add 10 ml of N/10 AgNO_3 filter wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator. Not less than 7.2 ml of N/10 NH_4SCN should be required.
- 6 **Bromate**—Dissolve 1 g in 10 ml of water and add 1 ml of dilute sulphuric acid. No yellow colour should be produced.
- 7 **Iodide**—Dissolve 1 g in 10 ml of water add 0.05 ml of ferric chloride solution and 1 ml of starch solution and allow to stand for 10 minutes. No blue colour should be produced.
- 8 **Sulphate**—Dissolve 1 g in 30 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.
- 9 **Heavy Metals and Iron**—Dissolve 4 g in 45 ml of water add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.
- 10 **Moisture**—Dry 5 g at 100° for one hour. The loss in weight should not exceed 25 mg.

(Continued overleaf)

AMMONIUM BROMIDE—continued

11 Assay—Dissolve 0.4 g. of the dried material from Test No. 9 in 50 ml. of water, add 10 ml. of dilute nitric acid and 50 ml. of N/10 AgNO_3 and titrate the excess of silver with N/10 NH_4SCN using ferric ammonium sulphate as indicator. Correct the titration for the amount of chloride found in Test No. 4.

1 ml. of N/10 $\text{AgNO}_3 \equiv 0.009796 \text{ g. } \text{NH}_4\text{Br}$

Not less than 99.5 per cent. should be indicated.

ANALAR**AMMONIUM CARBONATE**

Maximum Limits of Impurities

Non volatile Matter	0.01	per cent
Chloride (Cl)	0.0002	per cent
Sulphate (SO_4)	0.002	per cent
Phosphate (PO_4)	0.001	per cent
Silicate (SiO_2)	0.0005	per cent
Thiocyanate (SCN)	0.001	per cent
Heavy Metals (Pb)	0.0002	per cent
Iron (Fe)	0.0001	per cent
Tarry Matter	no reaction	
Arsenic (As_2O_3)	0.00002	per cent
	(0.2 part per million)	

1 Description—White powder or translucent crystalline masses with a strong ammoniacal odour. Consists of an approximately equimolecular mixture of ammonium bicarbonate NH_4HCO_3 —79.06 and ammonium carbamate $\text{NH}_2\text{COONH}_4$ —78.07.

2 Solubility—Partially soluble in alcohol. Dissolve 5 g. in 50 ml. of water, a clear colourless solution should be produced.

3 Non volatile Matter—Heat 10 g. gently until the greater part is volatilised, add 2 drops of sulphuric acid and ignite gently. Not more than 1 mg. of residue should be left.

4 Chloride—Boil 5 g. with 50 ml. of water until the volume is reduced to 5 ml., add 45 ml. of water, 1 ml. of dilute nitric acid and 1 ml. of silver nitrate solution. No opalescence should be produced.

5 Sulphate—Boil 5 g. with 50 ml. of water until the volume is reduced to 5 ml., add 45 ml. of water, 1 ml. of dilute hydrochloric acid and 1 ml. of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

6 Phosphate and Silicate—Dissolve 1 g. in 10 ml. of water and evaporate in a platinum dish until reduced to 1 ml., dilute with 20 ml.

of water, add 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" for silicate defined in appendix 2

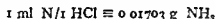
7 **Thiocyanate.**—Dissolve 5 g in 50 ml of water and boil until the volume is reduced to 10 ml, cool, add 10 ml of dilute nitric acid, 30 ml of water and 1 drop of ferric chloride solution. No red or yellowish brown colour should be produced

8 **Heavy Metals and Iron.**—Boil 10 g with 50 ml of water until the volume is reduced to 5 ml, add 5 ml of dilute hydrochloric acid, 30 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

9 **Tarry Matter.**—Treat 5 g with 15 ml of water and 7 g of citric acid and stir until dissolved. No tarry odour should be perceptible

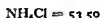
10 **Arsenic.**—Boil 10 g with 50 ml of water until the volume is reduced to 5 ml, add 45 ml of water, 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain

11 **Assay.**—Dissolve 2 g in 50 ml of N/1 HCl and 50 ml of water and titrate the excess of acid with N/1 NaOH using methyl red as indicator



Not less than 31 per cent of NH_3 should be indicated, equivalent to 95.3 per cent of NH_4HCO_3 , $\text{NH}_4\text{COONH}_2$

ANALAR AMMONIUM CHLORIDE



Maximum Limits of Impurities

Reaction	pH not less than 4.5
Non volatile Matter	0.01 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.00005 per cent
Phosphate (PO_4)	0.001 per cent
Thiocyanate (SCN)	0.001 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Tarry Matter	no reaction
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

(Continued overleaf)

AMMONIUM CHLORIDE—continued

- 1 **Description.**—A white crystalline powder
- 2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.
- 3 **Reaction.**—The reaction of a solution of 1 g in 10 ml of carbon dioxide free water should not be less than pH 4.5, using bromocresol green as indicator.
- 4 **Non-volatile Matter.**—Heat 10 g gently until the greater part is volatilised, add 2 drops of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.
- 5 **Sulphate.**—Dissolve 5 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.
- 6 **Nitrate.**—Dissolve 0.1 g in 1 ml of N/10 HCl and add 4 ml of diphenylbenzidine reagent. Any blue colour produced should not be greater than that produced by adding 4 ml of the reagent to 1 ml of N/10 HCl.
- 7 **Phosphate.**—Dissolve 1 g in 20 ml of water add 3 ml of dilute sulphuric acid 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2.
- 8 **Thiocyanate.**—Dissolve 5 g in 40 ml of water and mix with 0.5 ml of cupric sulphate solution and 0.1 ml of pyridine then add 5 ml of chloroform shake vigorously in a separating funnel and allow to separate. Draw off the lower layer shake it with 2 ml of water and again allow to separate. The chloroformic layer should not be coloured yellow or green.
- 9 **Heavy Metals and Iron.**—Dissolve 5 g in 45 ml of water add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.
- 10 **Tarry Matter.**—Moisten 2 g with 1 ml. of nitric acid and dry in a porcelain dish on a water bath. The residue should be perfectly white.
- 11 **Arsenic.**—Dissolve 5 g in 50 ml of water add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.
- 12 **Assay.**—Dissolve 0.2 g in 50 ml of water and titrate with N/10 AgNO₃ using potassium chromate as indicator.



Not less than 99 per cent should be indicated.

ANALAR AMMONIUM DICHROMATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Aluminium (Al)	0.003 per cent
Calcium (Ca)	0.005 per cent
Alkalis (Na)	0.1 per cent

1 **Description.**—Orange red crystals or a crystalline powder

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear orange-red solution should be produced.

3 **Chloride.**—Dissolve 1 g in 45 ml of water and add 5 ml of dilute nitric acid and 0.5 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate.**—Dissolve 2 g in 45 ml of water, add 7 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Aluminium and Calcium.**—Dissolve 2 g in 40 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

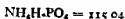
6 **Alkalis.**—Ignite 1 g in a porcelain crucible fitted with a lid, extract the residue with 30 ml of water and filter. Evaporate the filtrate and ignite the residue gently. Treat the residue with 20 ml of hot water, filter, evaporate and ignite. Not more than 5 mg should be obtained.

7 **Assay.**—Dissolve 0.15 g in 25 ml of water, add 2 g of potassium iodide and 10 ml of dilute hydrochloric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR AMMONIUM DIHYDROGEN PHOSPHATE



Maximum Limits of Impurities

Reaction	pH 4.2 to 4.4
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.001 per cent
Lead (Pb)	0.001 per cent
Iron (Fe)	0.002 per cent
Alkalis (Na)	0.05 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description**—Colourless crystals or a crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 100 ml of water should lie between the limits of pH 4.2 and 4.4 using bromocresol green as indicator.

4 **Chloride**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Dissolve 2.5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

6 **Nitrate**—Dissolve 2 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 **Lead**—Dissolve 7 g in 30 ml of water and 15 ml of dilute ammonia solution. Add 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be greater than that produced by adding 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample, 15 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 5 ml of standard lead solution (1 ml. = 0.01 mg Pb).

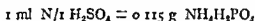
8 **Iron**—Dissolve 1 g in 10 ml of water, add 3 ml of dilute hydrochloric acid and 1 drop of $\text{N}/10 \text{ KMnO}_4$ mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that

produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

9 Alkalis.—Dissolve 2 g in 50 ml of water, add 4 ml of dilute ammonia solution, heat to boiling, add a solution of 10.5 g of lead acetate dissolved in 20 ml of water and allow to stand for 5 minutes. Filter, remove the excess of lead from the filtrate by means of hydrogen sulphide, again filter, evaporate the filtrate to dryness, and ignite the residue gently. Moisten with sulphuric acid, re-ignite and weigh. The weight of the residue, after deducting that due to alkali in the lead acetate, should not exceed 3 mg.

10 Arsenic.—Dissolve 5 g in 50 ml of water, add 12 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than 10.005 mg standard stain.

11 Assay.—Dissolve 3.5 g in 100 ml of water and 20 ml of sodium hydroxide solution. Distil, collect the distillate in 50 ml of N/1 H_2SO_4 and titrate the excess of acid with N/1 NaOH using methyl red as indicator.



Not less than 98 per cent and not more than 101 per cent should be indicated.

ANALAR AMMONIUM FLUORIDE



Maximum Limits of Impurities

Acid Fluoride ($NH_4F \cdot HF$)	0.1 per cent
Non-volatile Matter	0.02 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Silica (SiO_2)	0.2 per cent
Heavy Metals (Pb)	0.004 per cent
Iron (Fe)	0.002 per cent

1 Description.—Moist white crystals.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Acid Fluoride.—Dissolve 5 g in 50 ml of carbon dioxide free water and titrate to pH 6.6 with N/10 NaOH using bromothymol blue as indicator. Not more than 1.0 ml of N/10 NaOH should be required.

4 Non-volatile Matter.—Moisten 5 g with 2 drops of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 Chloride.—Dissolve 2 g in 50 ml of water and add 1 ml of

(Continued overleaf)

AMMONIUM FLUORIDE—continued

dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

6 **Sulphate**—To 2 g add 0.2 ml of N/1 Na_2CO_3 and 6 ml of hydrochloric acid and evaporate to dryness in a platinum dish on a water bath, dissolve the residue in 10 ml of water and 1 ml of N/1 HCl filter if necessary and add 1 ml of barium chloride solution. Any turbidity produced should not be greater than the "standard turbidity" defined in appendix 2.

7 **Silica**—Dissolve 2 g in 10 ml of water, add 5 ml of a 20 per cent aqueous solution of potassium chloride and 10 ml of 90 per cent alcohol allow to stand in a platinum dish for 5 minutes and then transfer to a test tube and examine immediately. No turbidity should be produced.

8 **Heavy Metals and Iron**—Dissolve 0.5 g in 45 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

ANALAR**AMMONIUM FORMATE****Maximum Limits of Impurities**

Reaction	pH 6.5 to 7.2
Non volatile Matter	0.02 per cent
Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.005 per cent
Lead (Pb)	0.0002 per cent
Iron (Fe)	0.0005 per cent

1 **Description**—Colourless deliquescent crystals.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 10 ml of carbon dioxide free water should lie between the limits pH 6.5 to 7.2 using bromothymol blue as indicator.

4 **Non-volatile Matter**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride**—Dissolve 5 g in 35 ml of water and add 15 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

6 **Sulphate**—Dissolve 2 g in 10 ml of water, add 0.2 ml of N/1 Na_2CO_3 evaporate to dryness and ignite gently under conditions which

will not introduce sulphur. Dissolve the residue in 10 ml of water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 5 ml of N/1 HCl and filter. To the filtrate add 30 ml of water and 1 ml of barium chloride solution and allow to stand for one hour. No turbidity or precipitate should be produced.

7 Lead.—Dissolve 12 g in 30 ml of water, add 5 ml of dilute ammonia solution and 1 ml of potassium cyanide solution. Dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any brown colour produced should not be deeper than that produced by the addition of 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample. 5 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 2 ml of standard lead solution (1 ml = 0.01 mg Pb).

8 Iron.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 Assay.—Dissolve 2.5 g in 50 ml of water, add 10 ml of neutral formaldehyde solution and titrate with N/1 NaOH using phenolphthalein as indicator.

$$1 \text{ ml N/1 NaOH} \equiv 0.06306 \text{ g H COONH}_4$$

Not less than 97 per cent should be indicated.

ANALAR

AMMONIUM MOLYBDATE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO ₄)	0.01 per cent
Phosphate (PO ₄)	0.001 per cent
Heavy Metals and Iron	passes test

1 Description.—White crystals or crystalline masses, sometimes with a greenish or yellowish tint.

2 Solubility.—Dissolve 5 g in 15 ml of water and 5 ml of dilute ammonia solution. A clear solution should be obtained.

3 Chloride.—Dissolve 2 g in 50 ml of water and add 1 g of citric acid, 0.1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 Sulphate.—Dissolve 5 g in 50 ml of water, add 5 g of citric acid, 0.1 ml of dilute hydrochloric acid and 1 ml of barium chloride

(Continued overleaf)

AMMONIUM MOLYBDATE—continued

solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Phosphate—Pour the solution from Test No. 2 into 75 ml of dilute nitric acid and allow to stand at about 40° for 6 hours. No yellow precipitate should be produced.

6 Heavy Metals and Iron—Dissolve 1 g in 45 ml of water, add 5 ml of sodium hydroxide solution, 2 ml of dilute ammonia solution and 1 drop of sodium sulphide solution. No darkening in colour should be observed.

7 Assay—Set up a Jones reductor and reactivate the amalgam by passing a mixture of 40 ml of dilute sulphuric acid and 60 ml of water through the column followed by 100 ml of water.

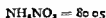
(a) *Blank*—Introduce 25 ml of acid ferric ammonium sulphate solution* into the receiver flask of the reductor, pass 200 ml of N/1 H₂SO₄ through the column, followed by 100 ml of water, add 5 ml of phosphoric acid to the contents of the receiver and titrate with N/10 KMnO₄.

(b) *Determination*—Introduce 25 ml of acid ferric ammonium sulphate solution into the receiver, run 100 ml of N/1 H₂SO₄ through the column followed by a solution of 0.1 g of the sample in 80 ml of water and 20 ml of dilute sulphuric acid. Then run through 100 ml of N/1 H₂SO₄ followed by 100 ml of water. Add 5 ml of phosphoric acid to the contents of the receiver, titrate with N/10 KMnO₄ and deduct the value of the blank.

$$1 \text{ ml N/10 KMnO}_4 = 0.00480 \text{ g MoO}_3$$

Not less than 81 per cent. MoO₃ should be indicated.

ANALAR AMMONIUM NITRATE



Maximum Limits of Impurities

Reaction	pH not less than 4.5
Non volatile Matter	0.01 per cent
Chloride (Cl)	0.0004 per cent
Sulphate (SO ₄)	0.01 per cent
Nitrite (NO ₂)	0.0005 per cent
Phosphate (PO ₄)	0.0005 per cent
Thiocyanate (SCN)	0.001 per cent
Heavy Metals (Pb)	0.0002 per cent
Iron (Fe)	0.0001 per cent

* Acid ferric ammonium sulphate solution contains 150 g of ferric ammonium sulphate and 150 ml of sulphuric acid in 1 litre.

- 1 **Description.**—Colourless crystals or a crystalline powder
- 2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced
- 3 **Reaction**—The reaction of a solution of 1 g in 10 ml of carbon dioxide free water should not be less than pH 4.5, using bromocresol green as indicator
- 4 **Non-volatile Matter.**—Moisten 10 g with 0.5 ml of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.
- 5 **Chloride.**—Dissolve 5 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced
- 6 **Sulphate.**—Dissolve 5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced
- 7 **Nitrite.**—Dissolve 1 g in 25 ml of water and add 1 ml of dilute sulphuric acid and 1 ml. of *m*-phenylenediamine sulphate solution. No yellow or brown colour should be produced
- 8 **Phosphate**—Dissolve 2 g in 20 ml of water, add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2
- 9 **Thiocyanate.**—Dissolve 5 g in 40 ml of water, add 0.5 ml of cupric sulphate solution and 0.5 ml of pyridine and mix, then add 5 ml of chloroform, shake vigorously and allow to separate. The chloroformic layer should not be coloured yellow or green
- 10 **Heavy Metals and Iron.**—Dissolve 10 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2
- 11 **Assay.**—Dissolve 3 g in 50 ml of water, add 20 ml of neutral formaldehyde solution and titrate with N/1 NaOH to pH 8.2 using phenol red as indicator
$$1 \text{ ml N/1 NaOH} \equiv 0.08005 \text{ g NH}_4\text{NO}_3$$

Not less than 98 per cent should be indicated

ANALAR AMMONIUM OXALATE



Maximum Limits of Impurities

Reaction	pH 6.0 to 7.0
Sulphated Ash	0.02 per cent
Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.003 per cent

1 **Description.**—Colourless crystals

2 **Solubility.**—Dissolve 5 g in 50 ml. of hot water. A clear colourless solution should be produced.

3 **Reaction.**—The reaction of a solution of 1 g in 40 ml of carbon dioxide-free water should lie between the limits of pH 6.0 and 7.0, using bromothymol blue as indicator.

4 **Sulphated Ash.**—Moisten 5 g with 0.5 ml of sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride.**—Dissolve 1 g in 45 ml of warm water and add 5 ml of dilute nitric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced.

6 **Sulphate.**—Dissolve 1 g in 20 ml of water, add 1 g of anhydrous sodium carbonate, evaporate to dryness and ignite under conditions that will not introduce sulphur. Dissolve the residue in 15 ml of hot water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 6 ml of dilute hydrochloric acid and filter. To the filtrate add 30 ml of water and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Nitrate.**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

8 **Heavy Metals and Iron.**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 **Calcium.**—Dissolve 10 g in 200 ml of hot water, allow to stand for 30 minutes, filter, wash, dry any insoluble matter and weigh. Not more than 1 mg should be obtained.

10 Assay.—Dissolve 0.3 g in 50 ml of water, add 5 ml of sulphuric acid and titrate with $N/10$ $KMnO_4$ at a temperature of about 60°

1 ml $N/10$ $KMnO_4 \equiv 0.007106$ g $(COONH_4)_2 H_2O$

Not less than 99 per cent should be indicated

ANALAR AMMONIUM PERSULPHATE

$(NH_4)_2S_2O_8 \equiv 228.21$

Maximum Limits of Impurities

Non-volatile Matter	0.1	per cent
Chloride (Cl)	0.001	per cent
Heavy Metals (Pb)	0.002	per cent
Iron (Fe)	0.001	per cent
Manganese (Mn)	0.0001	per cent

1 Description.—White granular crystals or a crystalline powder

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Non-volatile Matter.—Ignite 5 g gently, not more than 5 mg of residue should be left

4 Chloride.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 0.2 ml of silver nitrate solution. No opalescence should be produced

5 Heavy Metals and Iron.—Boil 1 g with 10 ml of dilute hydrochloric acid until the volume is reduced to 5 ml, cool, add 30 ml of water, 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

6 Manganese.—Dissolve 5 g in a mixture of 10 ml of dilute sulphuric acid, 10 ml of dilute ammonia solution, 3 ml of dilute nitric acid and 1 ml of silver nitrate solution previously heated to 90° , keep at that temperature for 1 minute and then cool rapidly. No pink colour should be produced

7 Assay.—Dissolve 0.5 g of the finely powdered material in a solution of 0.5 g of ferrous sulphate, 3 g of potassium iodide, 25 ml of dilute sulphuric acid and 25 ml of water, allow to stand for 30 minutes and titrate the liberated iodine with $N/10$ $Na_2S_2O_3$. Carry out a blank titration without the persulphate and make the necessary correction

1 ml $N/10$ $Na_2S_2O_3 \equiv 0.01141$ g $(NH_4)_2S_2O_8$

Not less than 98 per cent. should be indicated

ANALAR AMMONIUM PHOSPHATE



Maximum Limits of Impurities

Reaction	pH 7.8 to 8.2
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.001 per cent
Lead (Pb)	0.001 per cent
Iron (Fe)	0.001 per cent
Alkalis (Na)	0.03 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description.**—Colourless crystals or a white crystalline powder

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction.**—The reaction of a solution of 1 g in 100 ml of carbon dioxide-free water should lie between the limits of pH 7.8 and 8.2, using cresol red as indicator.

4 **Chloride.**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate.**—Dissolve 2.5 g in 50 ml of water, add 5 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

6 **Nitrate.**—Dissolve 2 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

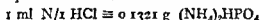
7 **Lead.**—Dissolve 7 g in 30 ml of water and 15 ml of dilute ammonia solution, add 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be greater than that produced by adding 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample, 15 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 5 ml of standard lead solution (1 ml = 0.01 mg Pb).

8 **Iron.**—Dissolve 1 g in 10 ml of water, add 3 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

9 **Alkalis**—Dissolve 2 g in 50 ml of water, heat to boiling, add a solution of 9.5 g of lead acetate in 20 ml of water and allow to stand for 5 minutes. Filter, and remove the excess of lead from the filtrate by means of hydrogen sulphide, again filter, evaporate the filtrate to dryness, and ignite the residue gently. Moisten with sulphuric acid and re-ignite. The weight of the residue, after deducting that due to alkalis in the lead acetate, should not exceed 2 mg.

10 **Arsenic**—Dissolve 5 g in 50 ml of water, add 12 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

11 **Assay**—Dissolve 5 g in 50 ml of water and titrate with N/1 HCl using bromophenol blue as indicator.



Not less than 97 per cent and not more than 102 per cent should be indicated.

ANALAR AMMONIUM SULPHATE



Maximum Limits of Impurities

Reaction	pH not less than 4.5
Non volatile Matter	0.02 per cent
Chloride (Cl)	0.0005 per cent
Nitrate (NO ₃)	0.002 per cent
Phosphate (PO ₄)	0.001 per cent
Thiocyanate (SCN)	0.001 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Arsenic (As ₂ O ₃)	0.0001 per cent
	(1 part per million)
Moisture	0.4 per cent

1 **Description**—A white crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 10 ml of carbon dioxide free water should not be less than pH 4.5 using bromocresol green as indicator.

4 **Non-volatile Matter**.—Ignite 5 g gently, not more than 1 mg of residue should be left.

5 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

(Continued overleaf)

AMMONIUM SULPHATE—continued

6 **Nitrate**.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 **Phosphate**.—Dissolve 1 g in 20 ml of water, add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

8 **Thiocyanate**.—Dissolve 5 g in 40 ml of water, add 0.5 ml of cupric sulphate solution and 0.5 ml of pyridine and mix, then add 5 ml of chloroform, shake vigorously and allow to separate. The chloroformic layer should not be coloured yellow or green.

9 **Heavy Metals and Iron**.—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

10 **Arsenic**.—Dissolve 5 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

11 **Moisture**.—Dry 5 g at 100° for 1 hour. The loss in weight should not exceed 20 mg.

12 **Assay**.—Dissolve 2 g of the dried material from Test No. 11 in 50 ml of water, add 20 ml of neutral formaldehyde solution, allow to stand for 10 minutes and titrate with N/1 NaOH to pH 8.2 using phenol red as indicator.

$$1 \text{ ml N/1 NaOH} \equiv 0.06607 \text{ g } (\text{NH}_4)_2\text{SO}_4$$

Not less than 99 per cent should be indicated.

ANALAR**AMMONIUM SULPHIDE SOLUTION****Maximum Limits of Impurities**

Non-volatile Matter	0.01 per cent
Carbonate (CO_2)	0.005 per cent

1 **Description**.—A clear yellow liquid with an ammoniacal odour.

2 **Non-volatile Matter**.—Evaporate 10 ml to dryness and ignite gently. Not more than 1 mg of residue should be left.

3 **Carbonate**.—To 10 ml add 3 ml of calcium chloride solution and allow to stand in a closed vessel for 1 hour. No precipitate should be produced.

4 **Assay**.—Mix 5 ml with 10 ml of dilute ammonia solution, add this to 23.5 ml of cupric sulphate solution, and filter. The filtrate should not be coloured blue, indicating the presence of not less than 8 per cent w/v of hydrogen sulphide.

ANALAR AMMONIUM TARTRATE



Maximum Limits of Impurities

Free Acid	2.0 ml N/1 per cent
Sulphated Ash	0.05 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Lead (Pb)	0.0002 per cent
Iron (Fe)	0.0004 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

- 1 **Description**—Colourless crystals or a crystalline powder
- 2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.
- 3 **Reaction**—Dissolve 5 g in 50 ml of cold water, the solution should have a pH value of 6.8 or should not require more than 1.0 ml of N/10 NaOH to produce this reaction.
- 4 **Sulphated Ash**—Ignite 5 g gently, moisten the residue with sulphuric acid and reignite. Not more than 2.5 mg of residue should be left.
- 5 **Chloride**—Dissolve 1 g in 50 ml of water and add 2 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.
- 6 **Sulphate**—Dissolve 2 g in 40 ml of water, add 5 ml of dilute hydrochloric acid and 5 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.
- 7 **Lead**—Dissolve 12 g in 40 ml of water, add 5 ml of dilute ammonia solution and 1 ml of potassium cyanide solution. Dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any brown colour produced should not be greater than that produced by the addition of 2 drops of sodium sulphide solution to 50 ml of solution containing 2 g of the sample, 5 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 2 ml of standard lead solution (1 ml = 0.01 mg Pb).
- 8 **Iron**—Dissolve 5 g in 12 ml of dilute hydrochloric acid, add 1 drop of N/10 KMnO_4 and mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

(Continued overleaf)

AMMONIUM TARTRATE—continued

9 **Arsenic.**—Dissolve 5 g in 50 ml of water, add 15 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than 2.005 mg standard stain.

10 **Assay.**—Dissolve 4 g in 100 ml of water, add 10 ml of neutral formaldehyde solution and titrate with N/1 NaOH using phenolphthalein as indicator.

1 ml N/1 NaOH \equiv 0.09208 g (CHOH COONH_4).

Not less than 98 per cent should be indicated.

ANALAR

AMMONIUM THIOCYANATE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0001 per cent
Alkalis (Na)	0.02 per cent
Other Sulphur Compounds (S)	0.001 per cent

1 **Description.**—Colourless deliquescent crystals.

2 **Solubility.**—Very soluble in alcohol. Dissolve 5 g in 50 ml of water, a clear colourless solution should be produced.

3 **Chloride.**—Dissolve 1 g in 30 ml of hydrogen peroxide (20 volumes), add 1 g of sodium hydroxide, warm gently and rotate the flask until a vigorous reaction commences. When this has abated add a further 30 ml of hydrogen peroxide and boil for 2 minutes, cool and add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not exceed that given by 0.5 ml of standard chloride solution (1 ml = 0.1 mg Cl) in an equal volume of solution containing the quantities of reagents used in the test and treated in the same manner.

4 **Sulphate.**—Dissolve 5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Heavy Metals.**—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

6 **Iron.**—Dissolve 6 g in 30 ml of water, add 1 ml of dilute hydrochloric acid and 10 ml of a mixture of equal volumes of amyl alcohol

and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 g dissolved in 5 ml of water with 1 ml of dilute hydrochloric acid, 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) and 10 ml of the mixture of amyl alcohol and amyl acetate in the same manner.

7 Alkalis.—Moisten 5 g with sulphuric acid and ignite gently; again moisten with sulphuric acid and ignite. Not more than 3 mg of residue should be left.

8 Other Sulphur Compounds.—Dissolve 5 g in 25 ml of water, add a mixture of 20 ml of dilute ammonia solution and 4 ml of silver nitrate solution and warm on a water-bath for 15 minutes. Any brown colour produced should not be greater than that given by adding a few drops of sodium sulphide solution to a mixture of 30 ml of water, 20 ml of dilute ammonia solution and 3 ml of N/1000 AgNO_3 , and warming on a water-bath for 15 minutes.

9 Assay.—Dissolve 0.3 g in 50 ml of water, add 5 ml of dilute nitric acid and 50 ml of N/10 AgNO_3 and titrate the excess silver with N/10 NH_4SCN using ferric ammonium sulphate as indicator.

$$1 \text{ ml N/10 AgNO}_3 \equiv 0.007612 \text{ g NH}_4\text{SCN}$$

Not less than 97 per cent should be indicated.

ANALAR AMMONIUM VANADATE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent

1 Description.—A white crystalline powder.

2 Solubility.—Slightly soluble in warm water forming a clear yellow solution. One gram should dissolve in 5 ml of dilute ammonia solution and 50 ml of warm water to form a clear colourless solution.

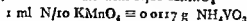
3 Chloride.—Dissolve 0.5 g in 50 ml of warm water, saturate with sulphur dioxide and add 2 ml of dilute sulphuric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced.

4 Sulphate.—Dissolve 1 g in 50 ml of warm water, add 2 ml of dilute hydrochloric acid and 1.5 g of hydroxylamine hydrochloride and warm to 60° for 3 minutes, cool, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

(Continued overleaf)

AMMONIUM VANADATE—continued

5. Assay.—Dissolve 0.5 g in 30 ml of water, add 5 ml of dilute sulphuric acid, warm on a water-bath and pass sulphur dioxide through the solution until reduction is complete and the solution is bright blue. Remove the excess of sulphur dioxide by boiling gently in a current of carbon dioxide, cool and titrate with N/10 KMnO_4 .



Not less than 98.5 per cent should be indicated.

ANALAR AMYL ACETATE



Maximum Limits of Impurities

Free Acid	1.0 ml N/1 per cent
Non-volatile Matter	0.01 per cent
Water	0.5 per cent

1. Description.—A clear colourless liquid with a characteristic odour.

2. Solubility.—One millilitre should dissolve to a clear solution in a mixture of 10 ml of 90 per cent ethyl alcohol and 10 ml of water, and the further addition of 2 ml of water should produce a turbidity.

3. Free Acid.—Dissolve 1 g in 10 ml of alcohol, add 0.1 ml of phenolphthalein solution and titrate with N/10 KOH . Not more than 0.1 ml of N/10 KOH should be required to produce a pink tint.

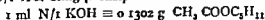
4. Weight per ml at 20°.—0.870 to 0.875 g

5. Boiling Range.—Not less than 90 per cent should distil between 136° and 142°.

6. Non-volatile Matter.—Evaporate 10 ml to dryness on a water-bath. Not more than 1 mg of residue should be left.

7. Water.—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 100 mg of water.

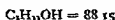
8. Assay.—Dissolve 2 g in 25 ml of alcohol, add 25 ml of N/1 KOH (alcoholic) and boil under reflux for 1 hour. Titrate the excess of alkali with N/1 HCl using phenolphthalein as indicator.



Not less than 97 per cent should be indicated.

ANALAR

AMYL ALCOHOL



Maximum Limits of Impurities

Acidity	0.1 ml N/1 per cent
Alkalinity	0.1 ml N/1 per cent
Non volatile Matter	0.0025 per cent
Furfural and Organic Impurities	passes test
Oily Impurities	results by Gerber and Rose Gottlieb methods differ by not more than 0.05 per cent
Bases of Indole Type	no reaction
Water	0.5 per cent

1 **Description.**—A clear colourless or very pale yellow liquid with a characteristic odour. Consists principally of iso butyl carbinol.

2 **Solubility.**—Mix 10 ml with 10 ml of hydrochloric acid. A clear solution should be formed which on the addition of 2.5 ml of water should separate into two layers.

3 **Reaction.**—Shake 10 ml with 10 ml of carbon dioxide free water. The mixture should be neutral to bromothymol blue or should require not more than 0.1 ml of N/10 NaOH or N/10 HCl to render it so. Vigorous shaking being employed during the titration.

4 **Weight per ml at 20°**—0.809 to 0.812 g

5 **Boiling Range.**—Not less than 90 per cent should distil within two degrees in the range 128° to 132°.

6 **Non-volatile Matter.**—Evaporate 25 ml to dryness on a water-bath. Not more than 0.5 mg of residue should be left.

7 **Furfural and Organic Impurities.**—Mix carefully 5 ml with 5 ml of sulphuric acid keeping the mixture cool. Not more than a yellow or light brown colour should be produced.

8 **Oily Impurities.**—Add 1 ml to a mixture of 10 ml of sulphuric acid (sp. gr. 1.820–1.825) and 11 ml of milk contained in a Gerber butyrometer tube, mix thoroughly and centrifuge at 1000 revolutions per minute for 5 minutes. Place the tube in a water bath at 65° for a few minutes and read off the percentage of fat. The percentage of fat indicated should not differ by more than 0.05 from a direct determination of the fat by the standard Rose Gottlieb method.

9 **Bases of Indole Type.**—Add 3 ml to a mixture of 4 ml of water, 0.2 ml of a saturated aqueous solution of potassium persulphate and 2 ml of a solution of 0.1 g of *p*-dimethylaminobenzaldehyde in

(Continued overleaf)

AMYL ALCOHOL—continued

2 ml of hydrochloric acid and 10 ml of absolute alcohol. Shake and allow to separate. No pink colour should develop within 10 minutes.

10 **Water.**—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess electrometrically with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 100 mg of water.

ANALAR
AMYL ALCOHOL
(Pyridine and Nitrogen Free)



Maximum Limits of Impurities

Acidity	0.1 ml N/1 per cent
Alkalinity	0.1 ml N/1 per cent
Non-volatile Matter	0.0025 per cent
Furfural and Organic Impurities	passes test
Oily Impurities	passes test
Bases of Indole Type	no reaction
Water	0.4 per cent
Pyridine and Organic Bases (N)	0.0007 per cent

This should pass the following test in addition to those in the preceding monograph.

Pyridine and Organic Bases—Shake 50 ml with 20 ml of N/5 H_2SO_4 , separate the acid layer and repeat the shaking with a second 20 ml of N/5 H_2SO_4 and again separate the acid layer. Mix the acid liquids, add 5 ml of sodium hydroxide solution, distil and collect the distillate in 10 ml of N/10 HCl. Titrate the excess of acid in the distillate with N/10 NaOH using bromo phenol blue as indicator. Not less than 9.75 ml of N/10 NaOH should be required.

ANALAR
AMYL NITRITE



Maximum Limit of Impurity

Non volatile Matter	0.01 per cent
---------------------	---------------

1 **Description.**—A clear pale yellow mobile liquid with a characteristic odour

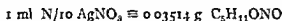
2 **Solubility.**—Insoluble in water Miscible in all proportions with alcohol

3 **Weight per ml at 20°.**—0.865 to 0.875 g

4 **Boiling Range.**—Not less than 90 per cent should distil between 90° and 100°

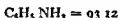
5 **Non-volatile Matter.**—Evaporate 10 ml to dryness on a water-bath Not more than 1 mg of residue should be left * 1 [2]

6 **Assay.**—Treat 0.5 g with 10 ml of alcohol in a stoppered flask, add 20 ml of N/10 AgNO_3 , 15 ml of a cold saturated solution of potassium chlorate and 5 ml of nitric acid Mix, shake vigorously during 5 minutes, filter and wash the filter with water Titrate the excess of silver in the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator



Not less than 90 per cent should be indicated

ANALAR ANILINE



Maximum Limits of Impurities

Hydrocarbons and Nitrobenzene	no reaction
Non-volatile Matter	0.005 per cent

1 **Description.**—A clear oily liquid, almost colourless when freshly distilled, darkening to a reddish-brown colour on keeping

2 **Solubility** (Hydrocarbons and Nitrobenzene)—Dissolve 5 ml in a mixture of 15 ml of dilute hydrochloric acid and 10 ml of water The warm solution should have no odour of nitrobenzene and on cooling to 10° no turbidity should be produced

3 **Weight per ml. at 20°.**—1.021 to 1.023 g

4. **Freezing Point**—Not below -8°

5. **Boiling Range.**—Not less than 95 per cent should distil between 182° and 184°

6 **Non-volatile Matter.**—Evaporate 10 ml to dryness and ignite gently Not more than 0.5 mg of residue should be left

ANALAR ANTIMONY POTASSIUM TARTRATE



Maximum Limits of Impurities

Free Acid	2.0 ml N/1 per cent
Free Alkali	2.0 ml N/1 per cent
Lead (Pb)	0.0005 per cent
Arsenic (As_2O_3)	0.001 per cent
	(10 parts per million)
Moisture	0.1 per cent

1 **Description**.—A white crystalline powder

2 **Solubility**.—Dissolve 1 g in 20 ml of water a clear colourless solution should be produced

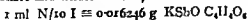
3 **Reaction**.—Dissolve 1 g in 50 ml of water. The solution should have a pH of 4.5, bromocresol green being used as indicator, or should not require more than 2 vol of either N/100 HCl or N/100 NaOH to produce this reaction

4 **Lead**.—Dissolve 2 g in 42 ml of water, add 7 ml of sodium hydroxide solution and 1 ml of potassium cyanide solution, mix and add 2 drops of sodium sulphide solution. Any colour produced should not be greater than that given by the addition of 2 drops of sodium sulphide solution to 50 ml of a solution containing 1 g of the antimony potassium tartrate, 7 ml of sodium hydroxide solution, 1 ml of potassium cyanide solution and 0.5 ml of standard lead solution (1 ml = 0.01 mg Pb)

5 **Arsenic**.—Dissolve 1 g in 26 ml of 20 per cent hydrochloric acid add 0.1 ml of stannous chloride solution and distil 20 ml. Wash the flask and condenser, return the distillate to the flask add 1 drop of stannous chloride solution and redistil 16 ml. To the distillate add 45 ml of water and 2 drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

6 **Moisture**.—Dry 5 g at 100° for 1 hour. The loss in weight should not exceed 5 mg

7 **Assay**.—Dissolve 0.8 g of the dried material from Test No 6 in 50 ml of water, add 5 g of sodium potassium tartrate and 1 g of sodium bicarbonate and titrate with N/10 I



Not less than 99.9 per cent should be indicated

ANALAR ANTIMONY TRICHLORIDE



Maximum Limits of Impurities

Oxychloride	trace
Iron (Fe)	0.0005 per cent
Arsenic (As_2O_3)	0.0005 per cent (5 parts per million)

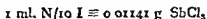
1 **Description.**—Colourless crystals fuming in moist air

2 **Solubility.**—Very soluble in absolute alcohol and in chloroform forming solutions which are not more than slightly turbid. Dissolve 5 g in 20 ml of dilute hydrochloric acid and 30 ml of water, a clear colourless solution should be produced

3 **Iron.**—Shake 1 g with 25 ml of water until decomposed, filter and wash with 5 ml of water. Evaporate the filtrate to about 1 ml, add 1 ml of dilute hydrochloric acid and sufficient water to produce 10 ml and then N/10 KMnO_4 drop by drop until a pink colour persists for 5 seconds. Finally add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) with 1 ml of dilute hydrochloric acid, 10 ml of water, 1 drop of N/10 KMnO_4 , and 5 ml of ammonium thiocyanate solution and shaking with 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate

4 **Arsenic.**—Dissolve 1 g in 26 ml of 20 per cent hydrochloric acid, add 0.1 ml of stannous chloride solution and distil 20 ml, wash the flask and condenser, return the distillate to the flask, add 1 drop of stannous chloride solution and redistil 16 ml. To the distillate add 45 ml of water and 2 drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

5 **Assay.**—Dissolve 0.5 g in 30 ml of water containing in solution 4 g of sodium potassium tartrate, add 2 g of sodium bicarbonate and titrate with N/10 I



Not less than 99 per cent should be indicated

ANALAR ARSENIOUS OXIDE



Maximum Limits of Impurities

Non volatile Matter	0.025 per cent
Sulphide	no reaction
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.005 per cent
Antimony	no reaction
Cadmium	no reaction
Tin	no reaction

1 **Description**.—A dense white powder

2 **Solubility**.—Dissolve 2 g in 25 ml of dilute ammonia solution and 25 ml of warm water. The solution should not be more than faintly hazy.

3 **Non-volatile Matter**.—Ignite 2 g gently in a silica crucible in a fume cupboard. Not more than 0.5 mg of residue should be left.

4 **Sulphide**.—Dissolve 5 g in 10 ml of sodium hydroxide solution and 15 ml of water and add 1 drop of lead acetate solution. The solution should not darken in colour.

5 **Heavy Metals and Iron**.—Pass hydrogen sulphide through the solution obtained in Test No. 2 for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

6 **Antimony, Cadmium and Tin**.—Dissolve 0.5 g in 50 ml of hot water and 2 ml of dilute hydrochloric acid. Precipitate with hydrogen sulphide, filter and wash with water, suspend the precipitate in 25 ml of water and add 50 ml of ammonium carbonate solution. A clear solution should be produced.

7 **Assay**.—Dissolve 0.4 g in 20 ml of water and 2 ml of sodium hydroxide solution, add 25 ml of dilute hydrochloric acid and 5 ml of potassium cyanide solution and titrate with $\text{M}/20 \text{ KIO}_3$ until the dark brown solution which is formed becomes light brown, then add 5 ml of starch solution and continue the titration until the blue colour disappears.



Not less than 99.8 per cent should be indicated.

ANALAR BARIUM ACETATE



Maximum Limits of Impurities

Chloride (Cl)	0.003 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (Na)	0.03 per cent

1. **Description**—White crystals or a crystalline powder
2. **Solubility**—Dissolve 5 g in 50 ml of water. A clear, or not more than faintly hazy, colourless solution should be produced
3. **Chloride**—Dissolve 3 g in 45 ml of water and add 6 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2
4. **Nitrate**.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear
5. **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of carbon dioxide-free water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2
6. **Alkalis and other Metals**—Dissolve 5 g in 100 ml of water, heat to boiling, add 15 ml of dilute sulphuric acid and allow to stand for 2 hours. Filter, evaporate the filtrate to dryness, ignite gently and weigh the residue. Not more than 5 mg should be obtained
7. **Assay**.—Dissolve 0.2 g in 100 ml of water and 2 ml of dilute acetic acid and add 5 g of ammonium chloride, heat to boiling and add 20 ml of potassium chromate solution slowly with constant stirring. Stand for 2 hours, filter on a sintered glass crucible, wash with cold water and dry at 130°

$$\text{Weight of BaCrO}_4 \times 1.0083 = \text{weight of } (\text{CH}_3\text{COO})_2\text{Ba}$$

Not less than 99 per cent should be indicated

ANALAR BARIUM CARBONATE



Maximum Limits of Impurities

Acid insoluble Matter	nil
Soluble Alkali	0.25 ml N/1 per cent
Chloride (Cl)	0.001 per cent
Nitrate (NO ₃)	0.004 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (Na)	0.03 per cent

1 **Description**—A white powder or friable masses

2 **Acid-insoluble Matter** (Sulphate, etc.)—Dissolve 5 g in 15 ml of dilute hydrochloric acid and 50 ml of water. A clear colourless solution should be produced.

3 **Soluble Alkali**—Shake 2 g for 5 minutes with 50 ml of carbon dioxide free water and filter. Titrate the filtrate with N/100 HCl using phenolphthalein as indicator. Not more than 0.5 ml of N/100 HCl should be required.

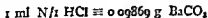
4 **Chloride**—Dissolve 1 g in 45 ml of water and 5 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Nitrate**—Dissolve 0.5 g in 10 ml of dilute acetic acid add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Heavy Metals and Iron**—Dissolve 1 g in 35 ml of water and 5 ml of dilute hydrochloric acid, boil to expel carbon dioxide, cool add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

7 **Alkalis and other Metals**—Dissolve 5 g in 100 ml of water and 20 ml of dilute hydrochloric acid, heat to boiling, add 12 ml of dilute sulphuric acid and allow to stand for 2 hours. Filter, evaporate the filtrate to dryness, ignite gently and weigh the residue. Not more than 5 mg should be obtained.

8 **Assay**—Dissolve 4 g in 50 ml of N/1 HCl and 50 ml of water and titrate the excess of acid with N/1 NaOH using bromophenol blue as indicator.



Not less than 99 per cent should be indicated

ANALAR BARIUM CHLORIDE



Maximum Limits of Impurities

Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium and Strontium (as sulphates)	0.2 per cent
Alkalis and other Metals (Na)	0.03 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml. of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

4 **Heavy Metals and Iron**—Dissolve 2 g in 45 ml of carbon dioxide free water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

5 **Calcium and Strontium**—Reduce 1 g to fine powder and shake with 20 ml of absolute ethyl alcohol for 5 minutes, filter, evaporate the filtrate to dryness on a water bath, moisten the residue with sulphuric acid and gently ignite. Not more than 2 mg of residue should be obtained.

6 **Alkalis and other Metals**—Dissolve 5 g in 100 ml of water, heat to boiling, add 15 ml of dilute sulphuric acid and allow to stand for 2 hours. Filter, evaporate the filtrate to dryness, ignite gently and weigh the residue. Not more than 5 mg should be obtained.

ANALAR BARIUM HYDROXIDE



Maximum Limits of Impurities

Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Sulphide	no reaction
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (Na)	0.06 per cent
Carbonate (BaCO_3)	0.5 per cent

(Continued overleaf)

BARIUM HYDROXIDE—*continued*

1 **Description**—Moist colourless crystals

2 **Chloride**—Dissolve 5 g in 45 ml of water neutralise with nitric acid add 3 drops in excess and 1 ml of silver nitrate solution Any opalescence produced should not be greater than the standard opalescence defined in appendix 2

3 **Sulphate**—Dissolve 2 g in 50 ml of water and 3 ml of dilute hydrochloric acid A clear colourless solution should be produced

4 **Nitrate**—Dissolve 1 g in 10 ml of dilute acetic acid add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling The blue colour should not entirely disappear

5 **Sulphide**—Dissolve 1 g in 25 ml of water and add 1 drop of lead acetate solution The solution should not darken in colour

6 **Heavy Metals and Iron**—Dissolve 1 g in 35 ml of water and 5 ml of dilute hydrochloric acid Boil to expel carbon dioxide cool add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds Any colour produced should not be deeper than the standard colours defined in appendix 2

7 **Alkalis and other Metals**—Dissolve 5 g in 100 ml of water and 10 ml of dilute hydrochloric acid heat to boiling add 10 ml of dilute sulphuric acid and allow to stand for 2 hours Filter evaporate the filtrate to dryness ignite gently and weigh the residue Not more than 10 mg should be obtained

8 **Assay and Carbonate**—Dissolve 5 g in 100 ml of carbon dioxide free water and titrate with N/1 HCl using phenolphthalein as indicator

1 ml N/1 HCl = 0.1578 g $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$

Then add a further 2 ml of N/1 HCl boil cool and titrate the excess acid with N/1 NaOH

1 ml N/1 HCl = 0.0987 g BaCO_3

Not less than 96 per cent of $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ and not more than 0.5 per cent of BaCO_3 should be indicated

ANALAR BARIUM NITRATE

$\text{Ba}(\text{NO}_3)_2 = 261.38$

Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.06 per cent
Alkalis and other Metals (Na)	0.03 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Heavy Metals and Iron**—Dissolve 2 g in 45 ml of carbon dioxide free water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

5 **Calcium**—Reduce 1 g to a fine powder and shake with 20 ml of absolute ethyl alcohol for 5 minutes, filter, evaporate the filtrate to dryness, moisten the residue with sulphuric acid and ignite gently. Not more than 2 mg of residue should be obtained.

6 **Alkalis and other Metals**—Dissolve 5 g in 100 ml of water, heat to boiling, add 15 ml of dilute sulphuric acid and allow to stand for 2 hours. Filter, evaporate the filtrate to dryness, ignite gently and weigh the residue. Not more than 5 mg should be obtained.

7 **Assay**—Dissolve 0.2 g in 100 ml of water and 2 ml of dilute acetic acid, add 5 g of ammonium chloride, heat to boiling, add 20 ml of potassium chromate solution slowly with constant stirring and allow to stand for 2 hours. Filter on a sintered glass crucible, wash with cold water and dry at 130°.

$\text{Weight of BaCrO}_4 \times 1.0316 = \text{weight of Ba(NO}_3)_2$

Not less than 99.5 per cent should be indicated.

ANALAR BENZALDEHYDE

$\text{C}_6\text{H}_5\text{CHO} = 106.12$

Maximum Limits of Impurities

Sulphated Ash	0.02 per cent
Chlorine (Cl)	0.1 per cent

1 **Description**—A colourless or very faintly yellow, highly refractive liquid with a characteristic odour.

2 **Solubility**—Miscible with alcohol and with ether.

3 **Weight per ml at 20°**—1.044 to 1.047 g

4 **Refractive Index**, n_D^{20} 1.544 to 1.547

5 **Boiling Range**—Not less than 95 per cent should distil between 178° and 181°.

BENZALDEHYDE—continued

6 **Sulphated Ash**.—Evaporate 5 g to dryness on a sand bath, moisten the residue with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

7 **Chlorine**.—Dissolve 1 g in 50 ml of amyl alcohol, add gradually 2 g of clean sodium metal pellets, warm under reflux until all the sodium has dissolved, and continue refluxing for a further 15 minutes. Cool, add 20 ml of water followed by 5 ml of N/10 AgNO₃ and sufficient nitric acid, added slowly with shaking to produce a clear solution. Filter, wash with water and titrate the filtrate and washings with N/10 NH₄SCN from a micro burette, using ferric ammonium sulphate as indicator. Run a blank on the reagents, omitting the benzaldehyde. The difference between the two titrations should not exceed 0.25 ml.

8 **Assay**.—Dissolve 2.5 g in 50 ml of hydroxylamine hydrochloride reagent* and leave to stand for one hour in a stoppered bottle. Add 0.4 ml of bromophenol blue solution and titrate with N/1 NaOH to the same blue colour as is exhibited by 50 ml of hydroxylamine hydrochloride reagent which has stood for one hour in a similar vessel. Correct the titration figure for the amount of free acid determined as follows. Dissolve 5 g in 25 ml of 90 per cent alcohol, previously neutralised to phenolphthalein, and titrate with N/10 NaOH.



Not less than 99 per cent should be indicated.

ANALAR BENZENE



Maximum Limits of Impurities

Non-volatile Matter	0.002 per cent
Organic Impurities	passes test
Thiophen	0.0002 per cent
Sulphur Compounds (CS ₂)	0.0003 per cent
Water	0.1 per cent

- 1 **Description**.—A clear colourless liquid with a characteristic odour.
- 2 **Solubility**.—Almost insoluble in water, miscible with alcohol and with ether forming clear colourless solutions.
- 3 **Weight per ml. at 20°**.—0.875 to 0.878 g.
- 4 **Refractive Index**.— n_D^{20} 1.498 to 1.505.
- 5 **Freezing Point**.—4° to 6°.

* Hydroxylamine hydrochloride reagent.—Dissolve 14 g of hydroxylamine hydrochloride in 80 ml of 50 per cent alcohol, add 1.6 ml of bromophenol blue solution, dilute to 100 ml with 50 per cent alcohol and adjust with N/1 NaOH to pH 3.8.

6 **Boiling Range.**—Not less than 95 per cent should distil between 79.5° and 81°

7 **Non-volatile Matter.**—Evaporate 55 ml to dryness on a water-bath. Not more than 1 mg of residue should be left

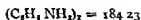
8 **Organic Impurities.**—To 5 ml contained in a dry test-tube add 2 ml of sulphuric acid, warm to 40° , agitate with a glass rod for 5 minutes and allow to separate. The acid layer should not be coloured deeper than pale yellow

9 **Thiophen.**—Shake 1 ml with 5 ml of isatin reagent* for 5 minutes and leave to stand for 15 minutes. No blue colour should be produced in the lower layer

10 **Sulphur Compounds.**—Boil 10 ml with 1 ml of absolute alcohol and 3 ml of potassium plumbite solution for 15 minutes under a reflux condenser and allow to stand for 5 minutes. No darkening should be produced in the aqueous layer

11 **Water.**—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 20 mg of water

ANALAR BENZIDINE



Maximum Limits of Impurities

Acid-insoluble Matter	nil
Sulphated Ash	0.02 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Organic Impurities	passes test
Sensitivity	passes test
Moisture	1.0 per cent

1 **Description.**—A white to pale buff crystalline powder

2 **Solubility.**—Readily soluble in alcohol forming a clear solution. Dissolve 1 g in 5 ml of dilute hydrochloric acid and 25 ml of water, a clear solution should be produced

3 **Melting Point.**— 128° to 129°

* **Isatin Reagent**—Dissolve 6 mg of isatin and 6 mg of ferric sulphate in 50 ml of sulphuric acid diluted with 8 ml of water

(Continued overleaf)

BENZIDINE—continued

4 **Sulphated Ash**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride**.—Boil 1 g with 3 ml of dilute nitric acid and 50 ml of water, cool and filter and to the filtrate add 1 ml of silver nitrate solution. No opalescence should be produced.

6 **Sulphate**.—Dissolve 1 g in 5 ml of dilute hydrochloric acid and 45 ml of water, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Organic impurities**.—Dissolve 0.1 g in 5 ml of glacial acetic acid. The solution should be clear and not more than faintly coloured and on the addition of 5 ml of hydrogen peroxide (10 volumes), no darkening should occur.

8 **Sensitivity**.—To 2 ml of the solution from Test No. 7, add 1 ml of freshly prepared blood solution (1 in 100 000). A blue or greenish blue colour should be produced.

9 **Moisture**.—Dry 2 g at 110° for 1 hour, the loss in weight should not exceed 20 mg.

ANALAR BENZOIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.02 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO ₄)	0.005 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Chlorine Compounds (Cl)	0.02 per cent
Oxygen absorbed (O)	0.02 per cent

* 1 **Description**.—Colourless needle crystals or flakes.

2 **Solubility**.—Slightly soluble in water, readily soluble in alcohol and in ether. Five grams should dissolve in 15 ml of dilute ammonia solution and 35 ml of water to form a clear colourless solution.

3 **Melting Point**.—121° to 122°.

4 **Sulphated Ash**.—Moisten 5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride**.—Boil 2 g with 40 ml of water and 1 ml of dilute nitric acid, cool, filter by suction and to the filtrate add 10 ml of water and 1 ml of silver nitrate solution. No opalescence should be produced.

6 Sulphate.—Boil 2 g with 40 ml of water and 1 ml of dilute hydrochloric acid; cool, filter by suction and to the filtrate add 10 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

7 Heavy Metals and Iron.—Pass hydrogen sulphide through the ammoniacal solution obtained in Test No 2 for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

8 Chlorine Compounds.—Mix 5 g with 3 g of anhydrous sodium carbonate, transfer to a small porcelain crucible and fill the latter completely with more sodium carbonate, well pressed down. Place a small platinum dish upside down over the crucible and invert the whole quickly. Add more sodium carbonate until the inverted crucible is half buried and heat strongly for 30 minutes. Cool and dissolve the mass in an excess of dilute nitric acid, add 5 ml of $N/10$ $AgNO_3$, filter, wash with water and titrate the filtrate and washings with $N/10$ NH_4SCN . Carry out a blank determination omitting the benzoic acid. The difference between the titrations should not exceed 0.3 ml

9 Oxygen Absorption.—Dissolve 1 g in 100 ml of hot water, add 10 ml of dilute sulphuric acid and titrate with $N/10$ $KMnO_4$. Not more than 0.25 ml should be required to produce a pink colour

10 Assay.—Dissolve 2 g in 10 ml of alcohol, add 30 ml of water and titrate with $N/1$ $NaOH$ using phenol red as indicator



Not less than 99.8 per cent should be indicated.

ANALAR

α -BENZOIN OXIME



Maximum Limit of Impurity

Sulphated Ash

0.2 per cent

Sensitivity to Copper (Cu) 1 100,000 minimum

Sensitivity to Molybdenum (Mo) 1 200,000 minimum

1 Description.—A white crystalline powder

2 Solubility.—Almost insoluble in water. Dissolve 1 g in 50 ml of ethyl alcohol. A clear colourless solution should be obtained

3 Melting Point.— 152° to 154°

4 Sulphated Ash.—Moisten 1 g with sulphuric acid and ignite gently. Not more than 2 mg of residue should be left

5 Sensitivity.—(a) Add 1 ml of a 2 per cent alcoholic solution to 50 ml of standard copper solution (1 ml = 0.01 mg Cu) rendered

(Continued overleaf)

α BENZOIN OXIME—*continued*

alkaline by the addition of 1 ml of dilute ammonia solution. A green turbidity should be produced immediately.

(b) Add 0.5 ml of a 2 per cent alcoholic solution to 50 ml of water containing 2.5 ml of a 0.02 per cent solution of ammonium molybdate and acidified with 0.05 ml of dilute sulphuric acid. A white turbidity should be produced within 5 minutes.

ANALAR

BENZOYL CHLORIDE



Maximum Limits of Impurities

Non volatile Matter	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Phosphorus Compounds (P)	0.0025 per cent
Sulphur Compounds (S)	0.003 per cent

1 **Description**—An almost colourless liquid fuming in moist air.

2 **Solubility**—Insoluble in water. Slowly and almost completely soluble in sodium hydroxide solution.

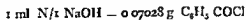
3 **Non-volatile Matter**—Evaporate 10 g. to dryness and ignite gently. Not more than 1 mg. of residue should be left.

4 **Heavy Metals and Iron**—Dissolve 2 ml. in 40 ml. of water and 10 ml. of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

5 **Phosphorus Compounds**—Boil 1 ml. with 1 ml. of water and 2 ml. of nitric acid for 1 minute, add 20 ml. of water, cool and filter, then add 10 ml. of ammonium nitro molybdate solution and maintain at about 40° for 2 hours. No yellow precipitate should be produced.

6 **Sulphur Compounds**—Boil 1 ml. with 1 ml. of water and 2 ml. of nitric acid for 1 minute, add 25 ml. of water, cool and filter, then add 20 ml. of water and 1 ml. of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

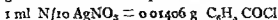
7 **Assay**—Dissolve 2.5 g. in 30 ml. of pyridine, add very slowly 50 ml. of water and titrate with N/1 NaOH using phenolphthalein as indicator.



Not less than 98 per cent should be indicated.

Dilute the neutralised liquid with water to 250 ml. and to 50 ml. of this solution add 5 ml. of nitric acid and 50 ml. of N/10 AgNO₃ solution.

Filter wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator



Not less than 98 per cent should be indicated

ANALAR

BENZYL-ISO-THIOUREA HYDROCHLORIDE (S-Benzylthiuronium Chloride)



Maximum Limit of Impurity

Sulphated Ash

0.1 per cent

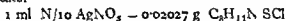
1 **Description**—White crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. The resulting solution should be not more than faintly turbid and should be acid to methyl red

3 **Melting-point**.— 150° to 151° or 176° to 177° (The substance is dimorphic)

4 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

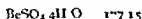
5 **Assay**—Dissolve 0.5 g in 10 ml of water, add 5 ml of dilute nitric acid and 50 ml of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator



Not less than 98 per cent should be indicated

ANALAR

BERYLLIUM SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.002 per cent
Lead (Pb)	0.002 per cent
Iron (Fe)	0.002 per cent
Aluminium (Al)	0.1 per cent
Alkalis and other Metals (Na)	0.03 per cent
Ammonia (NH_3)	0.1 per cent

1 **Description**—Colourless crystals or a white crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

(Continued overleaf)

BFRYLLIUM SULPHATE—continued

3 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 **Lead**.—Dissolve 1 g in 50 ml of water, add 1 ml of potassium cyanide solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

6 **Iron**—Dissolve 1 g in 10 ml of water, add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , then add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 **Aluminium**.—Dissolve 1 g in 2.5 ml of warm water, to 0.05 ml (1 drop) of this solution in a watch glass, add 0.05 g of powdered cesium sulphate, stir with a platinum wire and scratch the glass, cover with another watch glass to protect against evaporation. Any turbidity produced after 5 minutes should not be greater than that produced by adding 0.05 g of powdered cesium sulphate to 0.05 ml of an aluminium chloride solution containing 1 mg Al in 2.5 ml.

8 **Alkalis and other Metals**—Dissolve 2 g in 50 ml of hot water, add 10 ml of dilute ammonia solution, boil gently for 2 minutes and filter. Evaporate 30 ml of the filtrate to dryness and ignite the residue gently. Not more than 1 mg should be obtained.

9 **Ammonia**—Dissolve 2 g in 50 ml of water, add 40 ml of sodium hydroxide solution and distil 30 ml, collecting the distillate in 10 ml of N/10 H_2SO_4 . Titrate the excess of acid with N/10 NaOH using methyl red as indicator. Not less than 8.8 ml of N/10 NaOH should be required.

ANALAR BISMUTH NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Copper (Cu)	0.002 per cent
Lead (Pb)	0.02 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (Na)	0.02 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description.**—Colourless deliquescent crystals with an odour of nitric acid

2 **Solubility.**—Dissolve 5 g in 45 ml of water and 5 ml of nitric acid. A clear colourless solution should be obtained

3 **Chloride.**—Dissolve 1 g in 2 ml of dilute nitric acid, dilute with water to 50 ml and add 1 ml of silver nitrate solution. No opalescence should be produced

4 **Sulphate.**—Dissolve 1 g in 2 ml of dilute nitric acid, dilute with water to 50 ml, add 1 ml of barium nitrate solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Copper.**—Dissolve 1 g in 5 ml of dilute sulphuric acid, add 5 g of citric acid and make just ammoniacal with strong ammonia solution (about 8 ml). Make just acid to litmus with a few drops of acetic acid, adjust the volume to 15 ml and add 0.5 ml of a 0.5 per cent alcoholic solution of rubenic acid. The colour produced after 15 minutes should be no darker than that of a standard containing 2 ml of standard copper solution (1 ml = 0.01 mg Cu) and the quantities of the reagents used in the test

6 **Lead.**—Dissolve 6 g in 7 ml of nitric acid and 10 ml of water and add the hot solution slowly with vigorous stirring to 35 ml of a 30 per cent w/v solution of NaOH and stir for 5 minutes. Dilute to 80 ml and filter through a No. 41 Whatman paper. To 40 ml of the filtrate add nitric acid until the solution is just acid to litmus, then add 5 ml of strong ammonia solution and 2 drops of a 0.2 per cent alcoholic solution of gallein. The colour produced after 15 minutes should show no more blue tint than a standard containing 50 ml of standard lead solution (1 ml = 0.01 mg Pb), 5 ml of ammonia solution and 2 drops of the gallein solution

7 **Iron.**—Dissolve 0.1 g in 10 ml of dilute sulphuric acid, add 1 ml of hydroxylamine hydrochloride solution (10 per cent), 1 ml of a 0.5 per cent aqueous solution of o-phenanthroline and 5 g of ammonium acetate, mix and allow to stand for 5 minutes. Any colour produced should not be greater than that obtained by treating 0.1 ml of standard iron (1 ml = 0.01 mg Fe) dissolved in 10 ml of dilute sulphuric acid, in the same manner

8 **Alkalis and other Metals.**—Dissolve 2 g in 10 ml of dilute nitric acid and dilute to 100 ml. Precipitate the bismuth with hydrogen sulphide and filter. Evaporate the filtrate to dryness, moisten with sulphuric acid and ignite. Not more than 1 mg of residue should be obtained

9 **Arsenic.**—Heat 5 g with 2 ml of sulphuric acid and evaporate until white fumes are evolved, cool, add 5 ml of water and again evaporate to fuming. Cool, add 20 ml of water and 10 ml of stannated hydrochloric acid and distil 15 ml. To the distillate add a few drops of bromine solution, remove the excess of bromine by a few drops of stannous chloride solution, add 40 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

10 **Assay.**—Dissolve 0.5 g in 5 ml of dilute nitric acid, dilute to 150 ml with water, add 2 ml of dilute hydrochloric acid, then dilute ammonia solution until only faintly acid to litmus paper and allow to stand over

(Continued overleaf)

BISMUTH NITRATE—cont. nued

night. Filter through asbestos in a Gooch crucible, wash with water, dry at 110° and weigh the resulting bismuth oxychloride.

Weight of $\text{BiOCl} \times 1.862 = \text{weight of } \text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$

Not less than 98 per cent should be indicated

ANALAR BORIC ACID



Maximum Limits of Impurities

Chloride (Cl)	0.0002 per cent
Sulphate (SO_4)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.005 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description**—White crystals, powder or flakes

2 **Solubility**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Chloride**—Dissolve 6 g in 60 ml of boiling water and 1 ml of dilute nitric acid, cool and filter. To 50 ml of the filtrate add 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate**—Dissolve 6 g in 60 ml of boiling water and 1 ml of dilute hydrochloric acid, cool and filter. To 50 ml of the filtrate add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Heavy Metals and Iron**—Dissolve 2 g in 40 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

6 **Calcium**—Dissolve 2 g in 25 ml of hot water, add 1.5 ml of dilute acetic acid and 5 ml of ammonium oxalate solution and allow to stand for 10 minutes. No turbidity or precipitate should be produced.

7 **Arsenic**—Dissolve 2 g with 5 g of citric acid in 50 ml of hot water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain.

8 **Assay**—Dissolve 3 g in a mixture of 50 ml of glycerol and 50 ml of water and titrate with $\text{N}/1$ NaOH using phenolphthalein as indicator.

1 ml $\text{N}/1$ $\text{NaOH} \equiv 0.06184$ g H_3BO_3

Not less than 99.5 per cent should be indicated

ANALAR BROMINE

Br = 79.916

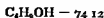
Maximum Limits of Impurities

Non-volatile Matter	0.01 per cent
Chlorine (Cl)	0.05 per cent
Iodine (I)	0.0001 per cent
Sulphate (SO_4)	0.005 per cent
Organic Impurities	no reaction
Arsenic (As_2O_3)	0.0001 per cent (1 part per million)

- 1 **Description.**—A dark reddish-brown fuming liquid
- 2 **Solubility.**—Slightly soluble in water. Soluble in glacial acetic acid
- 3 **Non-volatile Matter.**—Evaporate 3 ml in a porcelain dish on a water-bath. Not more than 1 mg of residue should be left
- 4 **Chlorine.**—Shake 3 ml with 0.5 g of zinc filings and 5 ml of water for 10 minutes and heat on a water-bath to remove the excess of bromine. Dissolve the residue in 20 ml of water, add 80 ml of dilute nitric acid, raise to the boiling point and aspirate air through the hot liquid until the liberated bromine is removed and the liquid is colourless. Cool, add 10 ml of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator. Not less than 8.6 ml of N/10 NH_4SCN should be required
- 5 **Iodine.**—Boil 1 ml with 50 ml of water, 1 ml of N/1 H_2SO_4 and a small fragment of marble until the solution is almost colourless. Cool, add 0.1 g of phenol and allow to stand for 2 minutes, then add 0.2 g of potassium iodide and 1 ml of starch solution. No blue colour should be produced
- 6 **Sulphate.**—Dissolve the residue obtained in Test No. 7 in 50 ml of water, and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 3 hours. No turbidity or precipitate should be produced
- 7 **Organic Impurities.**—Shake 1 ml with 30 ml of water and 10 ml of dilute ammonia solution and cool. A clear colourless solution free from oily drops should be obtained, and on evaporation to dryness a white residue should be left
- 8 **Arsenic.**—To 3 ml add 0.1 g of anhydrous sodium carbonate and 0.5 ml of water and evaporate to dryness on a water-bath. Dissolve the residue in 50 ml of water, add 10 ml of hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

ANALAR

n-BUTYL ALCOHOL



Maximum Limits of Impurities

Acidity	0.05 ml N/1 per cent
Alkalinity	0.05 ml N/1 per cent
Non volatile Matter	0.005 per cent
Aldehyde and ketones ($\text{C}_2\text{H}_5\text{CHO}$)	0.035 per cent
Fluorescent Impurities	passes test
Water	0.4 per cent

1 **Description**—A clear colourless liquid with a characteristic odour

2 **Solubility**—Miscible in all proportions with alcohol forming clear colourless solutions

3 **Reaction**—Shake 10 ml with 10 ml of carbon dioxide free water. The mixture should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so vigorous shaking being employed.

4 **Weight per ml at 20°**—0.809 to 0.811 g

5 **Refractive Index**— n_D^{20} 1.3990 to 1.4000

6 **Boiling Range**—Not less than 95 per cent should distil between 116° and 118°

7 **Non-volatile Matter**—Evaporate 20 ml to dryness on a water bath. Not more than 1 mg of residue should be left

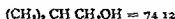
8 **Aldehyde and Ketones**—Mix in a stoppered cylinder 25 ml with 15 ml of water and 50 ml of hydroxylamine hydrochloride reagent allow to stand for 5 minutes and titrate with N/10 NaOH to the same green colour as shown by 50 ml of the reagent contained in a similar cylinder both being viewed down the axes of the cylinders. Not more than 1.0 ml of N/10 NaOH should be required

9 **Fluorescent Impurities**—When viewed in screened ultra violet light the sample should show no more fluorescence than that of a standard containing 0.00002 mg of anhydrous quinine base (previously dried at 100°) per ml of N/10 H_2SO_4

10 **Water**—Titrate 10.0 ml of methylalcohol electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess electrometrically with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 80 mg of water

ANALAR

250-BUTYL ALCOHOL

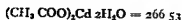


Maximum Limits of Impurities

Acidity	0.05 ml N/1 per cent
Alkalinity	0.05 ml N/1 per cent
Non-volatile Matter	0.0025 per cent
Aldehydes and Ketones ($\text{C}_4\text{H}_8\text{CHO}$)	0.035 per cent
Fluorescent Impurities	passes test
Water	0.6 per cent

- 1 **Description.**—A clear colourless liquid with a characteristic odour
- 2 **Solubility.**—Mix 10 ml with 100 ml of water. A clear colourless solution should be obtained
- 3 **Reaction.**—Shake 10 ml with 10 ml of carbon dioxide free water. The mixture should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so, vigorous shaking being employed
- 4 **Weight per ml. at 20°.**—0.802 to 0.805 g
- 5 **Refractive Index.**— n_D^{20} 1.394 to 1.396
- 6 **Boiling Range.**—Not less than 95 per cent should distil between 105° and 109°
- 7 **Non-volatile Matter.**—Evaporate 25 ml to dryness on a water-bath. Not more than 0.5 mg of residue should be left
- 8 **Aldehydes and Ketones.**—Mix 25 ml in a stoppered cylinder with 15 ml of water, 10 ml of ethyl alcohol and 50 ml of hydroxylamine hydrochloride reagent. Allow to stand for 5 minutes and titrate with N/10 NaOH to the same green colour as shown by 50 ml of the reagent and 10 ml of ethyl alcohol contained in a similar cylinder, both being viewed down the axes of the cylinders. Not more than 1.0 ml of N/10 NaOH should be required
- 9 **Fluorescent Impurities.**—When viewed in screened ultra violet light the sample should show no more fluorescence than that of a standard containing 0.00002 mg of anhydrous quinine base (previously dried at 100°) per ml of N/10 H_2SO_4
- 10 **Water.**—Titrate 10 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 10 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 60 mgm of water

ANALAR CADMIUM ACETATE



Maximum Limits of Impurities

Reaction	pH not less than 7.0
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 50 ml of carbon dioxide free water should not be less than 7.0 using phenol red as indicator.

4 **Chloride**—Dissolve 1 g in 50 ml of water add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

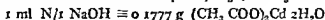
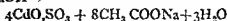
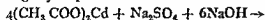
5 **Sulphate**—Dissolve 1 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Nitrate**—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 **Iron**—Dissolve 1 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml — 0.01 mg Fe) in the same manner.

8 **Alkalis and other Metals**—Dissolve 2 g in 100 ml of water and 10 ml of dilute sulphuric acid and electrolyse the solution for 30 minutes with a current of 3 to 4 amperes using a copper plated platinum electrode as described in appendix 5. Remove the cadmium from the cathode with nitric acid and replate it with copper make the solution just alkaline with dilute ammonia solution add 1 ml of dilute sulphuric acid and electrolyse for a further 15 minutes. Evaporate the solution to dryness and ignite gently. Not more than 2 mg of residue should be obtained.

9 **Assay.**—Dissolve 4 g in 150 ml of water, add 2 g of sodium sulphate (hydrated) and titrate with N/1 NaOH, with vigorous shaking, using thymolphthalein as indicator



Not less than 99 per cent should be indicated

ANALAR CADMIUM CHLORIDE



Maximum Limits of Impurities

Reaction	pH not less than 3.9
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Iron (Fe)	0.001 per cent
Copper (Cu)	0.001 per cent
Lead (Pb)	0.01 per cent
Zinc (Zn)	0.01 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent
Ammonia	no reaction
Arsenic (As_2O_3)	0.0001 per cent (1 part per million)

1 **Description.**—Colourless crystals

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained

3 **Reaction.**—The reaction of a solution of 1 g in 20 ml of carbon dioxide-free water should be not less than pH 3.9, using bromophenol blue as indicator

4 **Sulphate.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Nitrate.**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

6 **Iron.**—Dissolve 1 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

(Continued overleaf)

CADMIUM CHLORIDE—*continued*

7 **Copper.**—Dissolve 1 g in 10 ml of water, add 2 g of citric acid, dilute ammonia solution until alkaline (about 8 ml) and 1 ml of a 0.1 per cent aqueous solution of sodium diethyldithiocarbamate and shake with three successive portions, 5 ml, 3 ml and 2 ml of carbon tetrachloride. Dry the combined carbon tetrachloride extracts with a little anhydrous sodium sulphate. Any yellow colour produced should not be greater than that obtained by treating 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in the same manner.

8 **Lead.**—Dissolve 1 g in 15 ml of water, add 5 drops of glacial acetic acid and 2 ml of potassium chromate solution. No turbidity or precipitate should be produced.

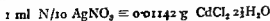
9 **Zinc.**—Dissolve 1 g in 50 ml of water, add 10 ml of sodium hydroxide solution and heat to boiling. Filter through a No. 41 Whatman paper and make the filtrate neutral to litmus paper with dilute sulphuric acid. To 30 ml add 1 drop of ammonium thiocyanate solution, 1 drop of dilute sulphuric acid and 1 ml of a 0.05 per cent alcoholic solution of *p*-dimethylamino-styryl β -naphthazole methyl iodide. The solution should show no pink colour when compared with a solution containing 30 ml of water, 1 drop of ammonium thiocyanate solution, 1 drop of dilute sulphuric acid and 1 ml of the reagent solution.

10 **Alkalis and other Metals.**—Moisten 2 g of the powdered sample with 3 ml of sulphuric acid and heat until fumes of sulphuric acid cease to be evolved, add 1 ml of sulphuric acid and heat again to fuming. Cool, dissolve in 100 ml of water and 10 ml of dilute sulphuric acid and electrolyse this solution for 30 minutes with a current of 3 to 4 amperes, using a copper plated platinum cathode as described in appendix 5. Remove the cadmium from the cathode with nitric acid and replat it with copper. Make the solution just alkaline with dilute ammonia solution, add 1 ml of dilute sulphuric acid and electrolyse for a further 15 minutes. Evaporate the solution to dryness and ignite gently. Not more than 2 mg of residue should be obtained.

11 **Ammonia.**—Boil 2 g with 10 ml of water and 5 ml of sodium hydroxide solution. No odour of ammonia should be perceptible.

12 **Arsenic.**—Dissolve 5 g in 20 ml of 20 per cent hydrochloric acid, add 3 drops of stannous chloride solution and distil 15 ml. To the distillate add 45 ml of water and 3 drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

13 **Assay.**—Dissolve 0.3 g in 100 ml of water and titrate with N/10 AgNO_3 using potassium chromate as indicator.



Not less than 99 per cent should be indicated.

ANALAR CADMIUM IODIDE



Maximum Limits of Impurities

Reaction	pH not less than 5.5
Iodate (IO_3)	0.0006 per cent
Sulphate (SO_4)	0.01 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (as sulphates)	0.2 per cent

1 **Description**—Pearly white flakes or a crystalline powder

2 **Solubility**—Dissolve 1 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 50 ml of carbon dioxide free water should not be less than pH 5.5 using methyl red as indicator.

4 **Iodate**—Dissolve 1 g in 20 ml of water and add 1 g of citric acid and 1 ml of starch solution. No blue colour should be produced.

5 **Sulphate**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

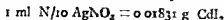
6 **Iron**—Moisten 1 g of the powdered sample with 3 ml of sulphuric acid and heat until fumes of sulphuric acid cease to be evolved. Dissolve the residue in 1 ml of dilute hydrochloric acid and 2 ml of water. Dilute to 10 ml with water and add 1 drop of N/10 KMnO_4 mix. Add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate. Shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 **Alkalis and other Metals**—Moisten 2 g of the powdered sample with 3 ml of sulphuric acid and heat until fumes of sulphuric acid cease to be evolved. Add 1 ml of sulphuric acid and heat again to fuming. Cool, dissolve in 100 ml of water and 10 ml of dilute sulphuric acid and electrolyse the solution for 30 minutes with a current of 3 to 4 amperes using a copper plated platinum cathode as described in appendix 5. Remove the cadmium from the cathode with nitric acid and replate it with copper. Make the solution just alkaline with dilute ammonia solution. Add 1 ml of dilute sulphuric acid and electrolyse for a further 15 minutes. Evaporate the solution to dryness and ignite gently. Not more than 2 mg of residue should be obtained.

(Continued overleaf)

CADMIUM IODIDE—continued

8 Assay.—Dissolve 0.8 g in 50 ml of water, add 50 ml of N/10 AgNO_3 and 5 ml of dilute nitric acid and titrate the excess of silver with N/10 NH_4SCN using ferric ammonium sulphate as indicator



Not less than 99 per cent should be indicated

. ANALAR**CADMIUM SULPHATE****Maximum Limits of Impurities**

Reaction	pH not less than 6.0
Chloride (Cl)	0.0005 per cent
Nitrate (NO_3)	0.002 per cent
Iron (Fe)	0.001 per cent
Copper (Cu)	0.001 per cent
Lead (Pb)	0.01 per cent
Zinc (Zn)	0.01 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent
Ammonia	no reaction
Arsenic (As_2O_3)	0.00002 per cent (0.2 part per million)

1 Description—Colourless crystals or a crystalline powder

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Reaction—The reaction of a solution of 1 g in 50 ml of carbon dioxide-free water should be not less than pH 6.0, using bromocresol purple as indicator

4 Chloride—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

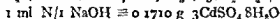
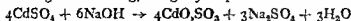
5-9 Tests for Nitrate, Iron, Copper, Lead, and Zinc are carried out as described for cadmium chloride

10 Alkalis and other Metals—Dissolve 2 g in 100 ml of water and 10 ml of dilute sulphuric acid and electrolyse the solution for 30 minutes with a current of 3 to 4 amperes using a copper-plated platinum cathode, as described in appendix 5. Remove the cadmium from the cathode with nitric acid and replate it with copper. Make the solution just alkaline with dilute ammonia solution, add 1 ml of dilute sulphuric acid and electrolyse for a further 15 minutes. Evaporate the solution to dryness and ignite gently. Not more than 2 mg of residue should be obtained

11 Ammonia.—Boil 2 g with 10 ml of water and 5 ml of sodium hydroxide solution. No odour of ammonia should be perceptible.

12 Arsenic.—Dissolve 10 g in 25 ml of 20 per cent hydrochloric acid, add 3 drops of stannous chloride solution and distil 15 ml. To the distillate add a few drops of bromine solution, remove the excess of bromine by a few drops of stannous chloride solution, add 45 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain.

13 Assay.—Dissolve 3 g in 150 ml of water and titrate with N/1 NaOH, with vigorous shaking, using thymolphthalein as indicator.



Not less than 99 per cent should be indicated.

ANALAR CAESIUM CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.015 per cent
Nitrate (NO_3)	0.004 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Aluminium (Al)	0.01 per cent
Calcium (Ca)	0.01 per cent
Magnesium (Mg)	0.025 per cent
Ammonia (NH_3)	0.002 per cent
Sodium	no reaction

1 Description.—White deliquescent crystals.

2 Solubility.—(a) Dissolve 0.5 g in 10 ml of water. The solution should be clear, colourless and neutral to litmus paper.

(b) Dissolve 0.5 g in 50 ml of 95 per cent alcohol. The solution should be clear and colourless and free from insoluble matter.

3 Sulphate.—Dissolve 0.5 g in 25 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

4 Nitrate.—Dissolve 0.5 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 Heavy Metals and Iron.—Dissolve 0.5 g in 10 ml of water, add 1 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

(Continued overleaf)

CÆSIUM CHLORIDE—continued

6 Aluminium.—Dissolve 0.5 g in 15 ml of water, add 1 g of ammonium acetate, 5 ml of dilute acetic acid and 1 ml of a 0.1 per cent aqueous solution of ammonium aurine-tricarboxylate ('aluminon'). Allow to stand for 5 minutes and then add 10 ml of ammonium carbonate solution. Any pink colour produced should not be greater than that produced by treating 0.5 ml of standard aluminium solution (1 ml = 0.01 mg Al) in the same manner.

7 Calcium.—Dissolve 0.5 g in 10 ml of water, add 1 ml of dilute ammonia solution and 1 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

8 Magnesium.—Dissolve 0.5 g in 10 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium phosphate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

9 Ammonia.—Dissolve 0.5 g in 50 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

10 Sodium.—Heat a little of the salt on a platinum wire in the Bunsen flame. The flame should be tinted the lilac-red colour characteristic of caesium and should show none of the bright yellow colour of the sodium flame.

11 Assay.—Dissolve 0.5 g of the fused sample in 100 ml of water, acidify with 5 ml of dilute nitric acid and add silver nitrate solution slowly with stirring until present in slight excess (about 15 ml is required). Heat to boiling, allow to cool in the dark, filter through asbestos in a Gooch crucible, wash first with water containing a little nitric acid, then with water, dry at 130° and weigh the AgCl.

Weight of AgCl $\times 1.1746$ = weight of CsCl

Not less than 99.9 per cent and not more than 100.1 per cent should be indicated.

ANALAR CALCIUM CARBONATE

$\text{CaCO}_3 = 100.09$

Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Phosphate (PO_4)	0.002 per cent
Silicate (SiO_2)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Ammonia	no reaction
Magnesium (Mg)	0.02 per cent
Alkalis (Na)	0.03 per cent

1 **Description** —A white powder

2 **Solubility** —Insoluble in water. Five grams is soluble with effervescence in 25 ml of water and 25 ml of dilute hydrochloric acid forming a clear colourless solution

3 **Chloride** —Dissolve 1 g in 45 ml of water and 5 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced

4 **Sulphate** —Dissolve 1 g in 45 ml of water and 5 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced

5 **Phosphate** —Dissolve 1 g in 6 ml of dilute hydrochloric acid and dilute to 40 ml. To 20 ml (retain the remainder for Test No 6) add 2 ml of dilute hydrochloric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than that given by a mixture containing 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4), 20 ml of water, 3 ml of dilute hydrochloric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 treated in a similar manner

6 **Silicate** —To 2 ml of the solution retained from Test No 5 add 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than that given by 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) treated similarly

7 **Heavy Metals and Iron** —Dissolve 1 g in 40 ml of water and 5 ml of dilute hydrochloric acid. Boil to expel carbon dioxide, cool, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

8 **Ammonia** —Warm 1 g with 10 ml of sodium hydroxide solution. No odour of ammonia should be perceptible

9 **Magnesium** —Dissolve 1 g in 5 ml of dilute hydrochloric acid and 25 ml of water, add 5 ml of dilute ammonia solution and 5 ml of dilute acetic acid, heat to boiling, add 22 ml of ammonium molybdate solution (10 per cent) in small quantities at a time and boil gently for 15 minutes. Cool, adjust the volume to 50 ml and filter. To 5 ml of the filtrate add 20 ml of water and 0.5 ml of a 0.1 per cent aqueous solution of titan yellow and 10 ml of sodium hydroxide solution. Any pink colour produced should not exceed that given by 0.2 ml of standard magnesium solution (1 ml = 0.1 mg Mg) in 25 ml of water when treated with 0.5 ml of titan yellow solution and 10 ml of sodium hydroxide solution

10 **Alkalis** —Dissolve 5 g in 25 ml of dilute nitric acid and add 10 ml of dilute ammonia solution and 25 ml of ammonium carbonate solution. Warm for a few minutes, filter, and wash the precipitate with water. Evaporate the filtrate and washings to dryness and ignite the

(Continued overleaf)

CALCIUM CARBONATE—*continued*

residue gently to remove ammonium salts. Dissolve the residue in 10 ml of water and 1 ml of dilute nitric acid; add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution, allow to stand for 1 hour and filter. Evaporate the filtrate to dryness; to the residue add 2 drops of sulphuric acid and ignite. Not more than 5 mg of residue should be obtained.

11 Assay—Dissolve 2 g in 50 ml of N/1 HCl and 50 ml of water and titrate the excess of acid with N/1 NaOH using bromophenol blue as indicator.

$$1 \text{ ml N/1 HCl} = 0.05005 \text{ g CaCO}_3$$

Not less than 99 per cent should be indicated.

ANALAR**CALCIUM CHLORIDE (DRIED)****Maximum Limits of Impurities**

Reaction	pH not greater than 8.5
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.004 per cent
Phosphate (PO_4)	0.002 per cent
Silicate (SiO_4)	0.004 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Barium and Strontium (Ba + Sr)	0.02 per cent
Alkalis (Na)	0.06 per cent
Arsenic (As_2O_3)	0.0002 per cent
	(2 parts per million)

1 Description—Opaque deliquescent white masses.

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Reaction—The reaction of a solution of 2 g in 50 ml of carbon dioxide free water should not be more alkaline than pH 8.5 using thymol blue as indicator.

4 11 Other Tests—These should be carried out as described under Calcium Chloride (Hydrated) Tests Nos 4 to 11 using in each test one half the specified amount of the sample.

12 Assay—Dissolve 0.2 g in 50 ml of water and titrate with N/10 AgNO_3 using potassium chromate as indicator.

$$1 \text{ ml N/10 AgNO}_3 = 0.005549 \text{ g CaCl}_2$$

Not less than 70 per cent and not more than 75 per cent should be indicated.

ANALAR

CALCIUM CHLORIDE (HYDRATED)



Maximum Limits of Impurities

Reaction	pH 6.5 to 7.5
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.001 per cent
Silicate (SiO_2)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium and Strontium (Ba + Sr)	0.01 per cent
Alkalis (Na)	0.03 per cent
Arsenic (As_2O_3)	0.0001 per cent

(1 part per million)

1 **Description**—Deliquescent colourless crystals

2 **Solubility**.—Dissolve 5 g in 50 ml of water, a clear colourless solution should be produced. One gram forms a clear solution in 6 ml of 90 per cent ethyl alcohol.

3 **Reaction**.—The reaction of a solution of 3 g in 50 ml of carbon dioxide free water should lie between the limits of pH 6.5 and 7.5, using bromothymol blue and phenol red as indicators.

4 **Sulphate**.—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Nitrate**.—Dissolve 2 g in 10 ml of water, add 10 ml of dilute sulphuric acid, allow to stand for 5 minutes with occasional stirring and filter. To 10 ml of the filtrate add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Phosphate**.—Dissolve 2 g in 40 ml of water. To 20 ml (retain the remainder for Test No. 7) add 3 ml of dilute hydrochloric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than that given by 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) treated in a similar manner.

7 **Silicate**.—To 2 ml of the solution retained from Test No. 6 add 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than that given by 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) treated similarly.

8 **Heavy Metals and Iron**.—Dissolve 2 g in 45 ml of carbon dioxide-free water, add 5 ml of dilute ammonia solution and pass hydrogen

(Continued overleaf)

CALCIUM CHLORIDE (HYDRATED)—*continued*

sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

9 **Barium and Strontium**—Dissolve 1 g in 10 ml of water add 10 ml of calcium sulphate solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

10 **Alkalis**—Dissolve 5 g in 100 ml of water and add 10 ml of dilute ammonia solution and 25 ml of ammonium carbonate solution. Warm for a few minutes, filter, and wash the precipitate with water. Evaporate the filtrate and washings to dryness and ignite the residue gently to remove ammonium salts. Dissolve the residue in 10 ml of water and 1 ml of dilute nitric acid, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution, allow to stand for 1 hour and filter. Evaporate the filtrate to dryness, to the residue add 2 drops of sulphuric acid and ignite. Not more than 5 mg of residue should be obtained.

11 **Arsenic**—Dissolve 5 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

ANALAR**CALCIUM SULPHATE (HYDRATED)****Maximum Limits of Impurities**

Carbonate (CO_3)	0.1	per cent
Chloride (Cl)	0.003	per cent
Nitrate (NO_3)	0.004	per cent
Iron (Fe)	0.001	per cent
Alkalis (Na)	0.03	per cent
Arsenic (As_2O_3)	0.00004	per cent
Loss on ignition	(0.4 parts per million)	20.5 to 21.5 per cent

1 **Description**—A white powder.

2 **Solubility**—Slightly soluble in hot or cold water. Dissolve 1 g in 50 ml of warm dilute hydrochloric acid. A clear colourless solution should be obtained.

3 **Carbonate**—Boil 1 g with 50 ml of water, cool and titrate with N/10 HCl using bromophenol blue as indicator. Not more than 0.3 ml should be required.

4 **Chloride**—Boil 3 g with 50 ml of water and 1 ml of dilute nitric acid and filter hot. To the cooled filtrate add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.

5 **Nitrate**—Mix 0.5 g with 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Iron—Boil 2 g with 2 ml of dilute hydrochloric acid and 6 ml of water and filter hot, treat 4 ml of the filtrate with 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not exceed that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 Alkalis—Boil 2 g with 6 ml of hydrochloric acid and 100 ml of water, add a slight excess of dilute ammonia solution followed by 2.5 g of ammonium oxalate and digest on the water bath for one hour, filter, evaporate the filtrate to dryness and ignite gently to remove ammonium salts. Dissolve the residue in 10 ml of water and 1 ml of dilute nitric acid, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution, allow to stand for 1 hour and filter. Evaporate the filtrate to dryness and ignite. Not more than 2 mg of residue should be obtained.

8 Arsenic—Treat 5 g with 10 ml of stannated hydrochloric acid and 50 ml of water and test as described in appendix 4. Any stain produced should not be greater than 0.002 mg standard stain.

9 Loss on Ignition—Heat 1 g to dull redness. The loss in weight should be not less than 205 mg and not more than 215 mg.

ANALAR CARBON DISULPHIDE

$\text{CS}_2 = 76.14$

Maximum Limits of Impurities

Acidity (SO_2)	0.001 per cent
Non volatile Matter	0.003 per cent
Hydrogen Sulphide	passes test

1 Description—A clear, almost colourless liquid with a characteristic odour.

2 Solubility—Insoluble in water. Miscible with absolute alcohol and with ether forming clear colourless solutions.

3 Acidity—Add 25 ml to a mixture of 10 ml of carbon dioxide-free water, 0.2 ml of phenolphthalein solution and 0.1 ml of N/10 NaOH and shake vigorously. The pink colour should not entirely disappear.

4 Weight per ml. at 20°—1.261 to 1.266 g

5 Refractive Index— n_D^{20} 1.6275 to 1.6283

6 Boiling Range—Not less than 95 per cent should distil between 46° and 47°.

7 Non-volatile Matter—Evaporate 25 ml to dryness on a water-bath. Not more than 1 mg of residue should be left.

8 Hydrogen Sulphide—Shake 20 ml with 10 ml of water and 1 ml of lead acetate solution. No darkening should be produced.

ANALAR CARBON TETRACHLORIDE



Maximum Limits of Impurities

Non volatile Matter	0.0015 per cent
Acidity	no reaction
Ionised Chloride	no reaction
Free Chlorine	no reaction
Oxygen absorbed (O)	0.0025 per cent
Carbon Disulphide (CS)	0.0005 per cent
Water (H ₂ O)	0.02 per cent

- 1 **Description**—A clear colourless liquid with a characteristic odour
- 2 **Solubility**—Almost insoluble in water. Miscible with alcohol and with ether forming clear colourless solutions
- 3 **Weight per ml at 20°**.—1.592 to 1.595 g
- 4 **Refractive Index**— n_D^{20} 1.4595 to 1.4610
- 5 **Boiling Range**—Not less than 95 per cent should distil between 76° and 77°
- 6 **Non volatile Matter**—Evaporate 20 ml to dryness on a water bath. Not more than 0.5 mg of residue should be left
- 7 **Acidity and Ionised Chloride**—Shake 10 ml with 10 ml of water for 1 minute. The aqueous layer should be neutral to litmus paper and on the addition of 1 ml of silver nitrate solution no opalescence should be produced
- 8 **Free Chlorine**—Shake 10 ml with 2 ml of cadmium iodide solution and 3 ml of starch solution for 1 minute. No blue colour should be produced
- 9 **Oxygen Absorption**—Shake 10 ml with a cooled mixture of 10 ml of sulphuric acid and 10 ml of N/10 $\text{K}_2\text{Cr}_2\text{O}_7$ for 10 minutes dilute with 50 ml of water cool add 1 ml of potassium iodide solution and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$. Not less than 9.5 ml of N/10 $\text{Na}_2\text{S}_2\text{O}_3$ should be required
- 10 **Carbon Disulphide**—Boil 10 ml with 1 ml of absolute alcohol and 3 ml of potassium plumbite solution for 15 minutes under a reflux condenser and allow to stand for 5 minutes. No darkening should be produced in the aqueous layer
- 11 **Water**—Titrate 20 ml of methyl alcohol electrometrically with Karl Fischer reagent then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess electrometrically with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 4 mg of water

ANALAR

CERIC AMMONIUM NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Iron (Fe)	0.002 per cent
Alkalis and other Metals (as sulphates)	0.05 per cent

- 1 **Description.**—An orange-yellow crystalline powder
- 2 **Solubility.**—Dissolve 5 g in 25 ml of water and 25 ml of dilute sulphuric acid. A clear solution should be produced which is orange-yellow when cold and orange-red when hot.
- 3 **Chloride.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.
- 4 **Sulphate.**—Dissolve 1 g in 10 ml of water, add 1 g of hydroxylamine hydrochloride and, when the initial reaction has subsided, boil until clear. Cool, dilute to 50 ml with water, add 1 ml of hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.
- 5 **Iron.**—Dissolve 0.5 g in 5 ml of water and 5 ml of dilute hydrochloric acid, boil for 1 minute, cool and add 1 drop of $\text{N}/10 \text{ KMnO}_4$ mix., add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml \equiv 0.01 mg Fe) in the same manner.
- 6 **Alkalis and other Metals.**—Dissolve 5 g in 100 ml of water, add 15 ml of dilute ammonia solution and boil. Filter and wash well with hot water, evaporate the filtrate to dryness, moisten the residue with a few drops of sulphuric acid, ignite and weigh. Not more than 2.5 mg should be obtained.
- 7 **Assay.**—Dissolve 2 g in 50 ml of water, add 10 ml of sulphuric acid and titrate with $\text{N}/10 \text{ FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$ using o-phenanthroline-ferrous complex as indicator.
 $1 \text{ ml } \text{N}/10 \text{ FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \equiv 0.05483 \text{ g } \text{Ce}(\text{NO}_3)_4 \cdot 2\text{NH}_4\text{NO}_3$
 Not less than 97 per cent. and not more than 102 per cent should be indicated.

ANALAR CHLOROACETIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Readily soluble in alcohol. Dissolve 5 g in 50 ml of water a clear colourless solution should be produced

3 **Freezing Point**—Not below 61° determined by melting in a test tube and seeding with a crystal of the original material

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

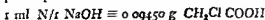
5 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

6 **Sulphate**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

7 **Nitrate**—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

8 **Heavy Metals and Iron**—Dissolve 5 g in 35 ml of water add 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2

9 **Assay**—Dissolve 3 g in 50 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator



Not less than 99 per cent should be indicated

ANALAR

1-CHLORO-2,4-DINITROBENZENE



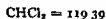
Maximum Limit of Impurity

Sulphated Ash	0.02 per cent
---------------	---------------

- 1 **Description** — Yellow crystals
- 2 **Solubility** — Insoluble in water. Soluble in ether. Dissolve 2 g in 50 ml of 90 per cent alcohol. A clear yellow solution should be produced.
- 3 **Melting Point** — 50° to 52°
- 4 **Sulphated Ash** — Ignite 5 g very gently until most of the material has volatilised. Allow to cool, moisten with sulphuric acid and gently re-ignite. Not more than 1 mg of residue should be left.

ANALAR

CHLOROFORM



Maximum Limits of Impurities

Non volatile Matter	0.001 per cent
Acidity	no reaction
Chloride	no reaction
Free Chlorine	no reaction
Ammonia	no reaction
Aldehyde	no reaction
Phosgene Decomposition Products	no reaction
Foreign Organic Matter	passes test
Water	0.05 per cent

- 1 **Description** — A clear colourless liquid with a characteristic odour. Contains about 2 per cent v/v of alcohol as a preservative.
- 2 **Solubility** — Slightly soluble in water. Miscible in all proportions with alcohol and with ether.
- 3 **Weight per ml at 20°** — 1.474 to 1.479 g
- 4 **Refractive Index** — n_D^{20} 1.4435 to 1.4445
- 5 **Boiling Range** — Not less than 95 per cent should distil between 60° and 62°
- 6 **Non volatile Matter** — Evaporate 50 g to dryness on a water bath. Not more than 0.5 mg of residue should be left.

(Continued overleaf)

CHLOROFORM—*continued*

7 Acidity—Shake 20 ml with 25 ml of carbon dioxide free water and allow to separate. To 5 ml of the aqueous layer add 0.1 ml of neutral litmus solution. The colour produced should not differ from that of 5 ml of carbon dioxide free water to which 0.1 ml of neutral litmus solution has been added.

8 Chloride—To 5 ml of the aqueous solution produced in Test No 7, add 0.1 ml of silver nitrate solution. No opalescence should be produced.

9 Free Chlorine—To 5 ml of the aqueous solution produced in Test No 7 add 1 ml of cadmium iodide solution and 1 ml of starch solution. No blue colour should be produced.

10 Ammonia and Aldehyde—To 10 ml of the aqueous solution produced in Test No 7 add 0.5 ml of Nessler's reagent. No yellow colour should be produced.

11 Phosgene Decomposition Products—Mix 15 ml with 0.02 g of vanillin and 0.02 g of resorcinol and allow to stand in the dark for 1 hour. The solution should remain perfectly clear and colourless and, on shaking with 1 ml of dilute ammonia solution and 4 ml of water and allowing to separate the aqueous layer should not show any immediate pink colour.

12 Foreign Organic Matter—Shake 20 ml with 10 ml of sulphuric acid for 5 minutes and allow to stand in the dark for 30 minutes. Both layers should remain colourless. Separate the two layers and dilute 2 ml of the acid layer with 5 ml of water. No unpleasant odour should be produced and on the addition of 10 ml of water and 1 ml of silver nitrate solution no opalescence should be produced.

Shake 15 ml of the separated chloroform layer from the above test with 30 ml of water for 3 minutes. Separate the aqueous layer and add to it 1 ml of silver nitrate solution. No opalescence should be produced.

Shake 25 ml with 15 ml of sulphuric acid and 0.2 ml of formaldehyde solution and allow to stand in the dark for 1 hour. The acid layer should not be more than faintly coloured.

13 Water—Titrate 20 ml of methyl alcohol electrometrically with Karl Fischer reagent then add 20 ml of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 10 mg of water.

ANALAR CHROMIUM CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.01 per cent
Iron (Fe)	0.01 per cent
Aluminium (Al)	0.05 per cent.
Ammonia	no reaction
Alkalis and other Metals (as sulphates)	0.3 per cent

1 **Description.**—Dark green deliquescent crystals

2 **Solubility.**—Dissolve 1 g in 50 ml of water. A clear dark green solution should be obtained

3 **Sulphate.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

4 **Iron.**—Dissolve 0.2 g in 10 ml of water, add 1 ml of dilute hydrochloric acid and 1 drop of $\text{N}/10$ KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

5. **Aluminium.**—Dissolve 2 g. in 50 ml of cold water, add 3 g of sodium peroxide in small portions and boil, filter and wash with water. Acidify the filtrate with hydrochloric acid, add a slight excess of dilute ammonia solution, boil off the excess of ammonia, filter, wash with hot water and ignite and weigh the residue. Not more than 2 mg should be obtained

6. **Ammonia.**—Dissolve 1 g in 10 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible

7 **Alkalis and other Metals.**—Dissolve 2 g in 50 ml of water, add 10 ml of dilute ammonia solution, boil gently for 2 minutes and filter. Evaporate 30 ml of the filtrate to dryness, moisten with sulphuric acid, ignite gently and weigh the residue. Not more than 3 mg should be obtained

8 **Assay.**—Dissolve 0.3 g in 100 ml of water, add 5 ml of sodium hydroxide solution and 2.5 g of sodium peroxide in small portions. Boil for 10 minutes, cool, add 40 ml of dilute sulphuric acid and 3 g

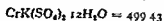
(Continued overleaf)

CHROMIUM CHLORIDE—*continued*

of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, using starch solution as indicator

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 \equiv 0.008883 \text{ g CrCl}_3 \cdot 6\text{H}_2\text{O}$$

Not less than 95 per cent and not more than 102 per cent should be indicated

ANALAR
CHROMIUM POTASSIUM SULPHATE
(Chrome Alum)
**Maximum Limits of Impurities**

Chloride (Cl)	0.001 per cent
Chromate (CrO_4)	0.03 per cent
Iron (Fe)	0.02 per cent
Aluminium (Al)	0.05 per cent
Ammonia	no reaction

1 **Description.**—Violet crystals or crystalline powder

2 **Solubility.**—Dissolve 1 g in 50 ml of water. A clear violet-blue solution should be produced

3 **Chloride.**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

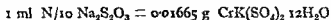
4 **Chromate.**—Dissolve 1 g in 20 ml of water, add 5 ml of dilute ammonia solution, heat to boiling and filter. The filtrate should be colourless

5 **Iron.**—Dissolve 0.1 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

6 **Aluminium.**—Dissolve 5 g in 50 ml of cold water, add 3 g of sodium peroxide in small portions and boil, filter and wash with water. Acidify the filtrate with hydrochloric acid, add a slight excess of dilute ammonia solution, boil off the excess of ammonia, filter, wash with hot water and ignite and weigh the residue. Not more than 5 mg should be obtained

7 **Ammonia.**—Dissolve 1 g in 10 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible

8 Assay—Dissolve 0.5 g in 100 ml of water add 5 ml of sodium hydroxide solution and 2.5 g of sodium peroxide in small portions Boil for 10 minutes cool add 40 ml of dilute sulphuric acid and 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator



Not less than 99.5 per cent and not more than 100.5 per cent. should be indicated.

ANALAR CHROMIUM TRIOXIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.02 per cent
Nitrate (NO_3)	0.004 per cent
Iron (Fe)	0.01 per cent
Aluminium and Chromium Salts	no reaction
Alkalis (Na)	0.1 per cent

1 Description—Dark red crystals or crystalline powder or almost black crystalline masses

2 Solubility—Dissolve 5 g in 50 ml of water. A clear orange coloured solution should be produced

3 Sulphate—Dissolve 1 g in 50 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 3 hours. No turbidity or precipitate should be produced

4 Nitrate—Dissolve 1 g in 5 ml of water add 6 ml of dilute ammonia solution heat to boiling add 3 g of barium chloride dissolved in 10 ml of water and filter. To 10 ml of the filtrate add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

5 Iron—Dissolve 0.1 g in 25 ml of water add 2.5 ml of dilute hydrochloric acid and pass sulphur dioxide through the solution until the chromate is completely reduced. Boil until the excess of sulphur dioxide is removed cool and adjust the volume to 25 ml. Add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 max add 5 vol of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

6 Aluminium and Chromium Salts—Dissolve 1 g in 50 ml of water and add 5 ml of dilute ammonia solution. The resulting solution should be pale yellow and free from turbidity or precipitate

CHROMIUM TRIOXIDE—continued

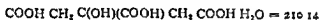
7 **Alkalis**—Ignite 1 g in a porcelain crucible fitted with a lid, extract the residue with 30 ml of hot water and filter. Evaporate the filtrate and ignite the residue gently. Treat the residue with 20 ml of hot water, filter, evaporate and ignite. Not more than 5 mg of residue should be obtained.

8 **Assay**.—Dissolve 1 g in sufficient water to produce 250 ml, to 25 ml of this solution add 2 g of potassium iodide and 10 ml of dilute hydrochloric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

$$1 \text{ ml N/10 } \text{Na}_2\text{S}_2\text{O}_3 \equiv 0.003333 \text{ g CrO}_3$$

Not less than 99 per cent should be indicated.

ANALAR CITRIC ACID



Maximum Limits of Impurities

Ash	0.01	per cent
Chloride (Cl)	0.0005	per cent
Sulphate (SO_4)	0.002	per cent
Oxalate (C_2O_4)	0.01	per cent
Tartrate	passes test	
Lead (Pb)	0.0002	per cent
Iron (Fe)	0.0001	per cent
Arsenic (As_2O_3)	0.00001	per cent
	(0.1 part per million)	

1 **Description**—Colourless crystals.

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Ash**—Ignite 10 g, not more than 1 mg of residue should be left.

4 **Chloride**.—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**.—Dissolve 5 g in 50 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

6 **Oxalate**.—Dissolve 1 g in 4 ml of water, add 2 ml of hydrochloric acid and boil for 1 minute with about 1 g of granulated zinc. Allow to stand for 2 minutes, decant into a test tube containing 0.25 ml of a 1 per cent aqueous solution of phenylhydrazine hydrochloride and heat to boiling. Cool rapidly, add an equal volume of hydrochloric acid

and 0.25 ml of a 5 per cent solution of potassium ferricyanide and shake. No red colour should be produced.

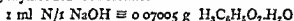
7. **Tartrate.**—Heat 1 g of the powdered acid with 10 ml of sulphuric acid at 100° for 10 minutes. The solution may become yellow but should not become brown.

8. **Lead.**—Dissolve 12 g in 40 ml of dilute ammonia solution, add 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be deeper than that given by the addition of 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample, 10 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 2 ml of standard lead solution (1 ml = 0.01 mg Pb).

9. **Iron.**—Dissolve 5 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

10. **Arsenic.**—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.001 mg standard stain.

11. **Assay.**—Dissolve 3 g in 50 ml of water and titrate with N/1 NaOH using thymol blue as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR COBALT CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.01 per cent
Nickel (Ni)	0.012 per cent
Iron (Fe)	0.003 per cent
Zinc (Zn)	0.005 per cent
Alkalis and Alkaline Earths (Na)	0.03 per cent

1. **Description.**—Deep red crystals or crystalline powder.

2. **Solubility.**—Dissolve 5 g in 50 ml of water. A clear pink solution should be produced.

3. **Sulphate.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

(Continued overleaf)

COBALT CHLORIDE—continued

4 **Nickel.**—Dissolve 1 g in 100 ml of a 10 per cent w/v solution of potassium thiocyanate. De-oxygenate by passing a stream of hydrogen for five minutes and polarograph over the range -0.25 volts to -0.65 volts, with an applied potential of 2 bolts. Return the solution in the polarographic cell, together with the mercury, to the solution under test. Add 2 ml of standard nickel solution (1 ml = 0.1 mg Ni), mix well, and polarograph as before. The wave height obtained in the first experiment should not be greater than the increase in height obtained in the second experiment.

5 **Iron.**—Dissolve 5 g in 50 ml of water, add 0.5 g of zinc oxide and boil for 1 minute. Filter and wash with water. Dissolve the residue in 4 ml of dilute hydrochloric acid and 50 ml of water, add 0.5 g of zinc oxide and boil for 1 minute. Filter and wash with water. Redissolve the residue in 5 ml of dilute hydrochloric acid and dilute with water to 50 ml. To 10 ml add 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be greater than that obtained by treating 15 ml of standard iron solution (1 ml = 0.01 mg Fe) in a similar manner.

6 **Zinc.**—Dissolve 5 g in 20 ml of water, add 1 ml of dilute hydrochloric acid and 5 ml of ammonium thiocyanate solution and extract with 15 ml of ether. Evaporate the ether from the ethereal extract and to the residue add cautiously 0.5 ml of nitric acid. When the vigorous reaction has ceased evaporate to dryness, dissolve the residue in 1 drop of dilute hydrochloric acid and 4 ml of water, boil and filter. To the filtrate add potassium cyanide solution (2 to 3 ml) until the precipitate formed just redissolves. Pass a current of air through the solution for 5 minutes, add 2 ml of formaldehyde solution and 2 drops of hydrochloric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Alkalis and Alkaline Earths.**—Dissolve 2 g in 50 ml of water, add 5 g of ammonium chloride and 5 ml of dilute ammonia solution and precipitate the cobalt with hydrogen sulphide, filter, evaporate the filtrate to dryness, moisten with sulphuric acid, ignite gently and weigh the residue. Not more than 2 mg should be obtained.

8 **Assay.**—Dissolve 2 g in 75 ml of water, add 2 g of hydrazine sulphate, 10 ml of dilute hydrochloric acid and warm until solution is complete. Slowly add 15 ml of strong ammonia solution with vigorous stirring, dilute to 150 ml with water, warm to 70° and electrolyse the solution at this temperature, for 1 hour with a current of 3 amperes, using a weighed platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.

$$\text{Weight of Co} \times 4.037 = \text{weight of CoCl}_2 \cdot 6\text{H}_2\text{O}$$

Not less than 97.5 per cent should be indicated

ANALAR COBALT NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Nickel (Ni)	0.01 per cent
Iron (Fe)	0.003 per cent
Zinc (Zn)	0.005 per cent
Alkalis and Alkaline Earths (Na)	0.03 per cent
Ammonia	no reaction

1 **Description** —Deliquescent red crystals

2 **Solubility** —Dissolve 5 g in 50 ml of water. A clear pink solution should be produced.

3 **Chloride** —Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate** —Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Nickel** —Dissolve 2 g in 100 ml of a 10 per cent w/v solution of potassium thiocyanate and proceed as in Test No. 4 in the specification for Cobalt Chloride.

6-8 **Tests for Iron, Zinc, Alkalis and Alkaline Earths** are carried out as described for Cobalt Chloride.

9 **Ammonia** —Dissolve 1 g in 10 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible.

10 **Assay** —Dissolve 2 g in 10 ml of water, add 10 ml of sulphuric acid and evaporate almost to dryness on a sand bath. Allow to cool, add 75 ml of water, 2 g of hydrazine sulphate and 10 ml of dilute hydrochloric acid and warm until solution is complete. Slowly add 15 ml of strong ammonia solution with vigorous stirring, dilute to 150 ml with water, warm to 70° and electrolyse the solution exactly as described for Cobalt Chloride.

$$\text{Weight of Co} \times 4.938 = \text{weight of } \text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$$

Not less than 97.5 per cent should be indicated.

ANALAR COBALT OXIDE

A variable mixture of

$\text{Co}_2\text{O}_3 = 165.88$
and $\text{Co}_3\text{O}_4 = 240.82$

Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Sulphur Compounds (SO_4)	0.01 per cent
Nickel (Ni)	0.04 per cent
Iron (Fe)	0.003 per cent
Alkalies and Alkaline Earths (Na)	0.06 per cent

1 Description—A greenish black powder

2 Solubility.—Boil 1 g with 5 ml of hydrochloric acid for 1 minute and dilute with water to 50 ml. A clear solution should be obtained.

3 Chloride.—Boil 1 g with 50 ml of water and 1 ml dilute nitric acid, cool and filter. To the filtrate add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.

4 Sulphur Compounds.—Boil 1 g with 3 ml of hydrochloric acid and 1 ml of nitric acid, dilute with water to 50 ml, add 5 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Nickel.—Dissolve 0.5 g in 3 ml of hydrochloric acid, evaporate to dryness on a water-bath, dissolve the residue in 100 ml of a 10 per cent w/v solution of potassium thiocyanate and proceed as in Test No 4 in the specification for Cobalt Chloride.

6 Iron.—Dissolve 2 g in 10 ml of hydrochloric acid and evaporate to dryness without baking. Dissolve in 50 ml of water and 1 ml of dilute hydrochloric acid, add 0.5 g of zinc oxide and boil for 1 minute. Filter and wash with water. Dissolve the residue in 4 ml of dilute hydrochloric acid and 50 ml of water, add 0.7 g of zinc oxide and boil for 1 minute. Filter and wash with water. Redissolve the residue in 5 ml of dilute hydrochloric acid and dilute to 40 ml with water. To 20 ml add 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be greater than that obtained by treating 6 ml of standard iron solution (1 ml. = 0.01 mg Fe) in a similar manner.

7 Alkalis and Alkaline Earths—Dissolve 2 g in 10 ml of hydrochloric acid add 50 ml of water, 12 g of ammonium chloride and a slight excess of dilute ammonia solution and precipitate the cobalt with hydrogen sulphide filter and evaporate the filtrate to dryness To the residue add 2 drops of sulphuric acid ignite gently and weigh the residue Not more than 4 mg should be obtained

ANALAR COBALT SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.002 per cent
Nickel (Ni)	0.01 per cent
Iron (Fe)	0.003 per cent
Zinc (Zn)	0.005 per cent
Alkalis and Alkaline Earths (Na)	0.03 per cent

1 Description—Small red crystals or crystalline powder

2 Solubility—Dissolve 5 g in 50 ml of water A clear pink solution should be produced

3 Chloride—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution No opalescence should be produced

4 Nitrate—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling The colour of the resulting solution should be a bluer shade of purple than that obtained by treating 1 g with 10 ml of water and 10 ml of sulphuric acid and heating to boiling

5 Nickel—Dissolve 2 g in 100 ml of a 10 per cent w/v solution of potassium thiocyanate and proceed as in Test No 4 in the specification for Cobalt Chloride

6-8 Tests for Iron, Zinc, Alkalis and Alkaline Earths are carried out as described for Cobalt Chloride

9 Assay—Carry out the assay as described for Cobalt Chloride

$$\text{Weight of Co} \times 4.769 = \text{weight of } \text{CoSO}_4 \cdot 7\text{H}_2\text{O}$$

Not less than 97.5 per cent should be indicated

ANALAR COPPER

$\text{Cu} = 63.54$

Maximum Limits of Impurities

Acid insoluble Matter	nil
Tin (Sn)	0.001 per cent
Silver (Ag)	0.001 per cent
Iron (Fe)	0.01 per cent
Bismuth (Bi)	0.0006 per cent
Lead (Pb)	0.002 per cent
Arsenic (As_2O_3)	0.0002 per cent
	(2 parts per million)

1 Description—A bright reddish metal

2 Solubility—Dissolve 10 g in 30 ml of nitric acid and 30 ml of water and adjust with water to 60 ml. A clear blue solution should be produced. Retain this solution for tests 3 to 6.

3 Tin—To 6 ml of the above solution add 6 ml of water and 4 ml of phenylarsonic acid solution (10 per cent). No turbidity should be produced.

4 Silver—To 24 ml of the solution from Test No. 2 add 50 ml of water and 1 ml of dilute hydrochloric acid. No opalescence should be produced.

5 Iron—Evaporate 3 vol of the solution from Test No. 2 to 1 ml, dilute to 100 ml with water and add 10 ml of sulphuric acid. Electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Evaporate the solution to 1 ml and dilute with water to 50 ml. To 10 ml add 10 ml of water, 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by the addition of 5 ml of ammonium thiocyanate solution to a solution containing 15 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

6 Bismuth—Dissolve 1 g of aluminium ammonium sulphate in 18 ml of the solution from Test No. 2, add 12 ml of water and strong ammonia in sufficient excess to retain all the copper in solution. Heat to boiling, filter immediately and wash with hot dilute ammonia solution until the washings are colourless. Suspend the precipitate in 25 ml of water, add 4 ml of nitric acid and warm until dissolved. Again add ammonia in excess, filter hot and wash with dilute ammonia solution until the precipitate is colourless. Suspend in 25 ml of water, add 5 ml

of dilute sulphuric acid, boil until almost clear then add a further 6 ml of dilute sulphuric acid in small portions and continue boiling until the solution is quite clear. Cool, dilute to 40 ml, add 0.1 ml of sulphurous acid* and 5 ml of potassium iodide solution and dilute with water to 50 ml. Any colour produced should not be deeper than that of a solution containing 32 ml of water, 11 ml of dilute sulphuric acid, 1.5 ml of standard bismuth solution (1 ml = 0.01 mg Bi), 0.1 ml of sulphurous acid and 5 ml of potassium iodide solution.

7 **Lead.**—Dissolve 2.5 g in 10 ml of nitric acid and 10 ml of water and to the hot solution add 0.1 g of ferrous sulphate. Cool, add 100 ml of water and strong ammonia solution in sufficient amount to redissolve all the copper. Filter or centrifuge and wash or extract the precipitate twice with dilute ammonia solution. Redissolve in 1 ml of dilute hydrochloric acid, add ammonia in excess and again filter or centrifuge. Redissolve the precipitate in 1 ml of dilute hydrochloric acid and 45 ml of water, add 0.5 g of hydroxylamine hydrochloride, heat to boiling, cool and dilute with water to 45 ml. Add 10 drops each of bromophenol blue and thymol blue solutions, then sodium hydroxide solution until the colour is just violet, followed by $N/1$ H_2SO_4 until just yellow. Polarograph over the range -0.3 volt to -0.8 volt. Return the solution in the polarographic cell, together with the mercury, to the solution under test, add 0.05 ml of standard lead solution (1 ml = 1 mg Pb), mix well and polarograph as before. The wave height in the first experiment should be less than the increase in height obtained in the second experiment.

8 **Arsenic.**—Mix 5 g with 4 g of potassium chlorate and 15 ml of water, add 20 ml of hydrochloric acid in small portions at a time until all the copper is dissolved and boil gently to remove the excess of chlorine. Add 10 ml of water, 10 ml of hydrochloric acid and sufficient stannous chloride solution to decolorise the solution, and distil 40 ml, to the distillate add 20 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

ANALAR CUPFERRON (Ammonium *N*-Nitrosophenylhydroxylamine)



Maximum Limit of Impurity

Sulphated Ash

0.2 per cent

1 **Description.**—White to biscuit coloured crystalline flakes, readily discolouring on exposure to air or light. This decomposition is retarded by keeping a piece of ammonium carbonate in the bottle.

* Sulphurous Acid.—Prepare a saturated solution of sulphur dioxide in water at about 25° and dilute with an equal volume of water. The solution must be freshly prepared.

(Continued overleaf)

CUPFERRON—continued

2 **Solubility**—A solution of 1 g in 50 ml of water should be no more than pale yellow and no more than slightly turbid

3 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite. Not more than 2 mg of residue should remain

ANALAR CUPRIC ACETATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Iron (Fe)	0.01 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent
Arsenic (As_2O_3)	0.001 per cent
(10 parts per million)	

1 **Description**—Dark green transparent crystals or crystalline powder

2 **Solubility**—Dissolve 1 g in 50 ml of water and 1 ml of dilute acetic acid. A clear blue solution should be produced

3 **Chloride**—Dissolve 1 g in 50 ml of water, add 1 ml of nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

4 **Sulphate**—Dissolve 1 g in 50 ml of water, add 1 ml of hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Iron**—To 2 g add 3 ml of nitric acid followed by 3 ml of sulphuric acid. Evaporate to dryness, add 1 ml of nitric acid and 1 ml of sulphuric acid and heat to fuming. Cool, add 100 ml of water, 10 ml of sulphuric acid and 1 drop of nitric acid and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Retain 85 ml of the solution for Test No. 6. To 6 ml add 15 ml of water, 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by the addition of 5 ml of ammonium thiocyanate solution to a solution containing 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

6 **Alkalis and other Metals**—Evaporate 85 ml of the solution from Test No. 5 to dryness, ignite gently and weigh the residue. Not more than 1.5 mg should be obtained

7 **Arsenic**—Heat 1 g with 1 ml of sulphuric acid until fumes of sulphuric acid are evolved, cool, add 5 ml of water and again heat to

fuming. Cool, dissolve the residue in 20 ml of 20 per cent hydrochloric acid, add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add a few drops of bromine solution, remove the excess of bromine by a few drops of stannous chloride solution, add 45 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

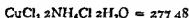
8 Assay.—Dissolve 0.8 g in 50 ml of water, acidify with dilute acetic acid, add 3 g of potassium iodide and titrate the liberated iodine with $N/10 \text{ Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

1 ml $N/10 \text{ Na}_2\text{S}_2\text{O}_3 \equiv 0.01996 \text{ g } (\text{CH}_3\text{COO})_2\text{Cu} \cdot \text{H}_2\text{O}$

Not less than 99 per cent should be indicated.

ANALAR

CUPRIC AMMONIUM CHLORIDE



Maximum Limits of Impurities

Free Acid	passes test
Sulphate (SO_4)	0.005 per cent
Iron (Fe)	0.01 per cent
Barium (Ba)	0.01 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent
Arsenic (As_2O_3)	0.0005 per cent
	(5 parts per million)

1 Description.—Pale blue crystals.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear blue solution should be produced.

3 Free Acid.—Dissolve 1 g in 20 ml of water, add 0.05 ml of $N/1 \text{ Na}_2\text{CO}_3$ and allow to stand for 15 hours. A precipitate should be formed.

4 Sulphate.—Dissolve 2 g in 50 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Iron.—Moisten 2 g with sulphuric acid and evaporate to dryness. Remoisten with sulphuric acid and heat to fuming. Dissolve the residue in 100 ml of water, add 10 ml of sulphuric acid and 1 drop of nitric acid and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Retain 85 ml of the solution for Test No. 7. To 6 ml add 15 ml of water, 1 ml of dilute hydrochloric acid, 1 drop of $N/10 \text{ KMnO}_4$ and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by the addition of 5 ml of ammonium thiocyanate solution to a solution

(Continued overleaf)

CUPRIC AMMONIUM CHLORIDE—continued

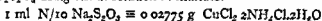
containing 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4

6 **Barium**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Alkalis and other Metals**—Evaporate 85 ml of the solution from Test No. 5 to dryness, ignite gently and weigh the residue. Not more than 1.5 mg should be obtained.

8 **Arsenic**—Dissolve 2 g in 10 ml of hydrochloric acid and 9 ml of water, add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add 45 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

9 **Assay**—Dissolve 1 g in 50 ml of water, add 5 ml of dilute acetic acid and 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.



Not less than 99 per cent should be indicated.

ANALAR CUPRIC CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.01	per cent
Iron (Fe)	0.02	per cent
Barium (Ba)	0.01	per cent
Alkalis and other Metals (as sulphates)	0.07	per cent
Oxygen absorbed (O)	0.008	per cent
Arsenic (As_2O_3)	0.0005	per cent
	(5 parts per million)	

1 **Description**—Moist blue, bluish green or green crystals.

2 **Solubility**—Dissolve 5 g in 50 ml of 90 per cent ethyl alcohol, a clear green solution should be produced. Dissolve 5 g in 10 ml of water, a clear deep green solution should be produced which on dilution to 50 ml becomes blue.

3 **Sulphate**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

4 **Iron**—Moisten 2 g with sulphuric acid and evaporate to dryness. Remoisten with sulphuric acid and heat to fuming. Dissolve the residue in 100 ml of water, add 10 ml of sulphuric acid and 1 drop of nitric acid.

and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Retain 85 ml of the solution for Test No 6. To 3 ml add 18 ml of water, 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by the addition of 5 ml of ammonium thiocyanate solution to a solution containing 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

5 **Barium**—Dissolve 1 g in 20 ml of water, add 0.5 ml of dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Alkalis and other Metals**—Evaporate 85 ml of the solution from Test No 4 to dryness, ignite gently and weigh the residue. Not more than 1 mg should be obtained.

7 **Oxygen Absorption**—Dissolve 5 g in 50 ml of water, add 5 ml of dilute hydrochloric acid and titrate with N/10 KMnO_4 using o-tolidine as indicator. Not more than 0.5 ml of N/10 KMnO_4 should be required.

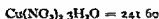
8 **Arsenic**—Dissolve 2 g in 10 ml of hydrochloric acid and 9 ml of water, add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add 45 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

9 **Assay**—Dissolve 0.8 g in 25 ml of water, add 5 ml of dilute acetic acid and 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 = 0.01705 \text{ g CuCl}_2 \cdot 2\text{H}_2\text{O}$$

Not less than 98 per cent should be indicated.

ANALAR CUPRIC NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Iron (Fe)	0.02 per cent
Barium (Ba)	0.01 per cent
Alkalis and other Metals (as sulphates)	0.2 per cent
Arsenic (As_2O_3)	0.0005 per cent
	(5 parts per million)

(Continued overleaf)

CUPRIC NITRATE—continued

1 **Description**—Hygroscopic blue crystals having an odour of nitric acid

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear blue solution should be produced

3 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

4 **Sulphate**—Dissolve 5 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced

5 **Iron**—Dissolve 2 g in 100 ml of water add 10 ml of sulphuric acid and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Retain 85 ml of the solution for Test No 7. To 3 ml add 20 ml of water 1 ml of dilute hydrochloric acid 1 drop of $N/10$ $KMnO_4$ and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by adding 5 ml of ammonium thiocyanate solution to a solution containing 20 ml of water 1 ml of dilute hydrochloric acid 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of $N/10$ $KMnO_4$

6 **Barium**—Dissolve 1 g in 50 ml of water add 0.5 ml of dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced

7 **Alkalis and other Metals**—Evaporate 85 ml of the solution from Test No 5 to dryness ignite gently and weigh the residue. Not more than 3 mg should be obtained

8 **Arsenic**—Heat 2 g with 3 ml of sulphuric acid in a porcelain dish until fumes of sulphuric acid are evolved cool add 5 ml of water and again heat to fuming. Cool dissolve the residue in 20 ml of 20 per cent. hydrochloric acid add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add a few drops of bromine solution remove the excess of bromine by a few drops of stannous chloride solution add 45 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

9 **Assay**—Ignite 1 g and weigh the resulting CuO

$$\text{Weight of } CuO \times 3.038 = \text{weight of } Cu(NO_3)_2 \cdot 3H_2O$$

Not less than 95 per cent should be indicated

ANALAR CUPRIC OXIDE

$\text{CuO} = 79.54$

Maximum Limits of Impurities

Water-soluble Matter	0.05 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.03 per cent
Nitrate	no reaction
Cuprous Oxide (Cu_2O)	0.05 per cent
Iron (Fe)	0.1 per cent
Alkalis and other Metals (as sulphates)	0.5 per cent
Arsenic (As_2O_3)	0.003 per cent
	(30 parts per million)

1 Description.—A black powder

2 Solubility.—Insoluble in water. Dissolve 5 g in 15 ml of hydrochloric acid and dilute to 50 ml with water, a green, not more than slightly turbid, solution should be produced

3 Water-soluble Matter.—Boil 2 g with 20 ml of water for 1 minute and filter, the filtrate should be neutral to litmus paper. Evaporate the filtrate to dryness, ignite the residue gently and weigh. Not more than 1 mg should be obtained

4 Chloride.—Dissolve 2 g in 20 ml of warm dilute nitric acid, cool, dilute with 30 ml of water and add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

5 Sulphate.—Dissolve 1 g in 7 ml of warm dilute hydrochloric acid, cool, dilute to 50 ml with water, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 Nitrate.—Heat 5 g in a test-tube, in the mouth of which is placed a piece of moist blue litmus paper. The paper should remain blue

7 Cuprous Oxide.—Dissolve 1 g in 7 ml of hot dilute hydrochloric acid, cool, add 50 ml of water and titrate with $\text{N}/10 \text{ KMnO}_4$, using o toluidine as indicator. Not more than 0.1 ml of $\text{N}/10 \text{ KMnO}_4$ should be required

8 Iron.—Dissolve 1 g in 5 ml of dilute nitric acid, add 100 ml of water and 10 ml of sulphuric acid and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes with a current of 1 ampere. Retain 90 ml of the solution for Test No 9. To 1 ml add 20 ml of water, 1 ml of dilute hydrochloric acid, and 1 drop of $\text{N}/10 \text{ KMnO}_4$ and 5 ml

(Continued overleaf)

CUPRIC OXIDE—*continued*

of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by the addition of 5 ml of ammonium thiocyanate solution to a solution containing 20 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

9 **Alkalis and other Metals**.—Evaporate 90 ml of the solution from Test No 8 to dryness. Ignite gently and weigh the residue. Not more than 4 mg should be obtained.

10 **Arsenic**.—Dissolve 0.3 g in 20 ml of 20 per cent hydrochloric acid, add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add 40 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

11 **Assay**.—Dissolve 0.3 g in 10 ml of dilute hydrochloric acid, dilute to 50 ml with water, add 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 = 0.007954 \text{ g CuO}$$

Not less than 97.5 per cent should be indicated.

ANALAR CUPRIC SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Iron (Fe)	0.015 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent.
Arsenic (As_2O_3)	0.001 per cent
	(10 parts per million)

1 **Description**.—Blue crystals or a crystalline powder.

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear blue solution should be produced which should remain free from sediment on standing for 2 hours.

3 **Chloride**.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Iron**.—Dissolve 2 g in 100 ml of water, add 1 drop of nitric acid and 10 ml of sulphuric acid and electrolyse the solution for 30 minutes with a current of 2 amperes as described in appendix 5. Remove the copper from the cathode with nitric acid, add 1 g of urea to the solution and electrolyse for a further 15 minutes using a current of 1 ampere. Retain 85 ml of the solution for Test No 5. To 4 ml add 20 ml of

water, 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml. of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by adding 5 ml of ammonium thiocyanate solution to a solution containing 20 ml of water 1 ml of dilute hydrochloric acid 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

5 Alkalis and other Metals—Evaporate 85 ml of the solution from Test No. 4 to dryness ignite gently and weigh the residue. Not more than 1.5 mg should be obtained.

6 Arsenic—Dissolve 1 g in 20 ml of 20 per cent hydrochloric acid add sufficient stannous chloride solution to decolorise and distil 15 ml. To the distillate add a few drops of bromine solution remove the excess of bromine by a few drops of stannous chloride solution add 40 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

7 Assay—Dissolve 1 g in 25 ml of water add 5 ml of dilute acetic acid and 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 \approx 0.02497 \text{ g CuSO}_4 \cdot 5\text{H}_2\text{O}$$

Not less than 99 per cent should be indicated.

ANALAR

CUPROUS CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.05 per cent
Iron (Fe)	0.01 per cent
Cupric Chloride (CuCl_2)	1.0 per cent
Alkalis and other Metals (as sulphates)	0.25 per cent
Arsenic (As_2O_3)	0.001 per cent
(10 parts per million)	

1 Description—A greyish white crystalline powder becoming pale green on storage.

2 Solubility—Almost insoluble in water. Soluble in ammonia solution. Dissolve 1 g in 10 ml of hydrochloric acid and dilute to 50 ml with water a clear, colourless to pale green solution should be produced.

3 Sulphate—Warm 1 g with 20 ml of water 3 ml of dilute hydrochloric acid and 5 ml of hydrogen peroxide (20 volumes) until solution is complete. Cool add 20 ml. of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

(Continued overleaf)

CUPROUS CHLORIDE—continued

4 **Iron**—Evaporate 40 ml of the solution from which the copper has been removed in Test No 8 until the volume is reduced to 1 ml. Cool, dilute the residue to 25 ml and add 1 ml of dilute hydrochloric acid, 1 drop of N/10 KMnO_4 and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be deeper than that obtained by adding 5 ml of ammonium thiocyanate solution to a solution containing 25 ml of water, 1 ml of dilute hydrochloric acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of N/10 KMnO_4 .

5 **Cupric Chloride**—Suspend 2 g in 20 ml of water, add 5 ml of dilute acetic acid and 2 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator. Not more than 1.5 ml of N/10 $\text{Na}_2\text{S}_2\text{O}_3$ should be required.

6 **Arsenic**—Dissolve 1 g in 20 ml of 20 per cent hydrochloric acid, add a few drops of stannous chloride solution and distil 15 ml. To the distillate add 45 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

7 **Alkalis and other Metals**—Evaporate the remainder (160 ml) of the solution from Test No 8 to dryness, ignite gently and weigh the residue. Not more than 1 mg should be obtained.

8 **Assay**—Dissolve 0.5 g in a mixture of 20 ml of hydrogen peroxide (20 volumes) and 15 ml of sulphuric acid, evaporate to fuming, cool, add 1 ml of nitric acid, dilute with water to 200 ml and add 1 g of urea. Electrolyse the solution for 45 minutes with a current of 3 amperes as described in appendix 5. Wash the cathode with water then with acetone, dry and weigh. Deduct the weight of copper derived from the cupric chloride content as determined in Test No 5 (1 ml N/10 $\text{Na}_2\text{S}_2\text{O}_3$ = 0.00635 g Cu).

Weight of Cu \times 1.558 = weight of CuCl

Not less than 97 per cent should be indicated.

ANALAR DIGITONIN



Maximum Limits of Impurities

Sulphated Ash	0.3 per cent
Moisture	5.0 per cent

1 **Description**—A white or cream coloured powder.

2 **Solubility**—Slightly soluble in water. Dissolve 0.5 g in 50 ml of 95 per cent alcohol. A clear colourless solution should be obtained.

3 **Specific Rotation.**— $[\alpha]_D^{20}$ not more than -50° in 75 per cent acetic acid solution

4 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite gently Not more than 3 mg of residue should be left

5 **Moisture**—Dry 0.5 g at 110° for 1 hour The loss in weight should not exceed 25 mg

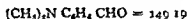
6 **Assay.**—Dissolve 0.2 g of the dried material from Test No. 5 in 20 ml of 95 per cent alcohol add a slight excess of a 1 per cent solution of cholesterol in 95 per cent alcohol (about 15 ml) and allow to stand overnight Filter on a weighed sintered glass crucible, wash with about 10 ml of cold 95 per cent alcohol dry at 80° and reweigh To the weight obtained add 0.0016 g for each 10 ml in the final volume of liquid

Corrected weight of precipitate $\times 0.7588 =$ weight of $C_{25}H_{40}O_2$

Not less than 95 per cent should be indicated

ANALAR

p-DIMETHYLAMINO BENZALDEHYDE



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Organic Impurities	passes tests
Bases of Indole type	no reaction

1 **Description.**—A white or pale yellow crystalline powder

2 **Solubility.**—Readily soluble in dilute hydrochloric acid Dissolve 5 g in 50 ml of 90 per cent ethyl alcohol, a clear yellow solution should be produced

3 **Melting Point.**— 73° to 75°

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently Not more than 1 mg of residue should be left

5 **Organic Impurities.**—(a) Dissolve 1 g in 20 ml of dilute hydrochloric acid A clear solution, with no red or brown tint, should be obtained

(b) Dissolve 0.1 g in 10 ml of sulphuric acid The colour of the solution should not be more than very pale brownish-yellow

6 **Bases of Indole Type.**—Dissolve 0.02 g in 0.4 ml of hydrochloric acid and 2 ml of absolute alcohol and add 4 ml of water, 0.2 ml of a saturated aqueous solution of potassium persulphate and 3 ml of amyl alcohol Shake and allow to separate No pink colour should develop within 10 minutes

ANALAR DIMETHYLANILINE



Maximum Limits of Impurities

Hydrocarbons	no reaction
Aniline and Methylaniline	0.2 per cent

1 **Description.**—A clear oily liquid almost colourless when freshly distilled darkening to a reddish brown colour on keeping

2 **Acid insoluble matter (Hydrocarbons)**—Dissolve 5 ml in a mixture of 15 ml of dilute hydrochloric acid and 10 ml of water. On cooling the solution to 10° no turbidity should be produced

3 **Weight per ml at 20°**—0.954 to 0.958 g

4 **Refractive Index**— n_D^{20} 1.555 to 1.558

5 **Freezing Point.**—Not below 1°

6 **Boiling Range**—Not less than 95 per cent should distil between 192° and 194°

7 **Aniline and Methylaniline**—Mix 25 g with 20 ml of a 10 per cent v/v solution of acetic anhydride in benzene allow to stand in a stoppered flask for 30 minutes add 50 ml of N/1 NaOH shake well and titrate with N/1 HCl using phenolphthalein as indicator. Carry out a blank determination in the same manner omitting the dimethylaniline. The difference between the titrations should not exceed 0.5 ml

ANALAR DIMETHYLGLYOXIME



Maximum Limit of Impurity

Sulphated Ash	0.05 per cent
---------------	---------------

1 **Description**—A white crystalline powder

2 **Solubility**—Almost insoluble in water. Dissolve 1 g in 50 ml of boiling 90 per cent ethyl alcohol a clear colourless solution should be produced.

3 **Melting Point.**—237° to 240° with decomposition

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

5 **Assay**—Dissolve 0.2 g in 20 ml of warm ethyl alcohol and to the solution add a boiling solution of 0.3 g of nickel sulphate dissolved

in 100 ml of water, then add 1 g of sodium acetate dissolved in 10 ml of water and allow to stand for 1 hour. Filter off the precipitate in a Gooch crucible, wash with a little water containing 1 drop of dilute ammonia solution, dry at 110° and weigh.

Weight of precipitate $\times 0.8038$ = weight of $C_6H_5O_2N_2$

Not less than 98 per cent should be indicated

ANALAR
DIMETHYL YELLOW
(*p*-Dimethylaminoazobenzene)
pH range . . . 2.8 to 4.6

$(CH_3)_2N \cdot C_6H_4 \cdot N \cdot C_6H_5 = 225.28$

Maximum Limits of Impurities

Alcohol insoluble Matter	nil
Sulphated Ash	0.2 per cent
Moisture	1.0 per cent

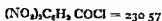
- 1 **Description**—Golden brown crystals or crystalline powder
- 2 **Solubility**.—Almost insoluble in water. Dissolve 0.1 g in 50 ml of warm 95 per cent alcohol, a clear orange solution should be produced
- 3 **Melting Point**.—116° to 118°
- 4 **Sulphated Ash**.—Moisten 1 g with sulphuric acid and ignite gently. Not more than 2 mg of residue should be left
- 5 **Sensitivity**.—To 50 ml of water add 0.05 ml of N/10 NaOH and 0.1 ml of the solution from Test No. 2, a clear yellow solution should be produced which should change to pink on the addition of 0.5 ml of N/10 HCl
- 6 **Moisture**.—Dry 1 g at 100° for 1 hour. The loss in weight should not exceed 10 mg
- 7 **Assay**.—Dissolve 0.7 g of the dried material from Test No. 6 in alcohol and dilute to 250 ml with further alcohol. To 50 ml add 15 g of sodium hydrogen tartrate dissolved in 80 ml of water. Boil and titrate the hot solution, slowly with shaking with N/10 $TiCl_3$ in an inert atmosphere, until the solution is largely decolorised. Boil the solution again and continue the titration until complete decolorisation has occurred. Run an auxiliary determination using 10 ml of the solution, 40 ml of alcohol and 15 g of sodium hydrogen tartrate dissolved in 80 ml of water.

1 ml N/10 $TiCl_3 \equiv 0.005633$ g $C_{14}H_{15}N_2$

Not less than 95 per cent should be indicated

ANALAR

3:5-DINITROBENZOYL CHLORIDE



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Phosphorus Compounds (P)	0.0025 per cent
Sulphur Compounds (S)	0.003 per cent

1. **Description.**—Yellow crystalline needles decomposing in moist air. Decomposed by water or by alcohol.

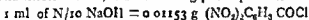
2. **Melting Point.**—67° to 69°

3. **Sulphated Ash.**—Ignite 2 g gently until fully charred, moisten with sulphuric acid and gently reignite. Not more than 1 mg of residue should be left.

4. **Phosphorus Compounds.**—Boil 1 g with 1 ml of water and 2 ml of nitric acid for 1 minute, add 20 ml of water, cool and filter, to the filtrate add 10 ml of ammonium nitro-molybdate solution and maintain at about 40° for two hours. No yellow precipitate should be produced.

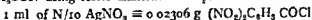
5. **Sulphur Compounds.**—Boil 1 g with 1 ml of water and 2 ml of nitric acid for 1 minute, add 25 ml of water, cool and filter. To the filtrate add 20 ml of water and 1 ml of barium chloride solution and allow to stand for one hour. No turbidity or precipitate should be produced.

6. **Assay.**—Dissolve 0.5 g in 20 ml of pyridine, add very slowly 20 ml of water and titrate with N/10 NaOH using phenolphthalein as indicator.



Not less than 99 per cent should be indicated.

To the neutralised solution add 20 ml of nitric acid and 25 ml of N/10 AgNO₃. Filter, wash with water and titrate the filtrate and washings with N/10 NH₄SCN using ferric ammonium sulphate as indicator.



Not less than 99 per cent should be indicated.

ANALAR

2:4-DINITROPHENYLHYDRAZINE



Maximum Limit of Impurity

Sulphated Ash	0.05 per cent
---------------	---------------

1. **Description.**—Red crystals or orange-red crystalline powder.

2 **Solubility.**—Insoluble in water and in ether. Dissolve 0.5 g. in 1 ml. of warm sulphuric acid, carefully add 10 ml. of alcohol, and warm gently. A clear orange-red solution should be produced.

3 **Melting Point.**—194° to 199° with decomposition.

4 **Sulphated Ash.**—Ignite 2 g. gently until fully charred, moisten with sulphuric acid and gently reignite. Not more than 1 mg. of residue should be left.

ANALAR DIOXAN (Diethylene Dioxide)



Maximum Limits of Impurities

Acetal ($\text{CH}_3\text{C}(\text{OC}_2\text{H}_5)_2$)	1.0 per cent
Peroxide (H_2O_2)	0.0015 per cent
Water	0.4 per cent

1 **Description.**—A clear colourless liquid with a characteristic odour.

2 **Solubility.**—Miscible with water, alcohol and ether in all proportions to give clear colourless solutions.

3 **Weight per ml. at 20°.**—1.030 to 1.035 g.

4 **Refractive Index at 20°.**—1.419 to 1.425.

5 **Freezing Point.**—Not below 11.5°.

6 **Boiling Range.***—Not less than 97 per cent should distil between 101° and 103°.

7 **Acetal.**—Dissolve 7 g. of hydroxylamine hydrochloride in 100 ml. of water, add a few drops of bromophenol blue and titrate to the full blue colour with N/10 NaOH. Weigh 2 g. of the sample, add 50 ml. of dilute sulphuric acid and 50 ml. of water and distil half the bulk, collecting the distillate in the neutralised hydroxylamine solution. Stopper the receiver and allow to stand for 1 hour with occasional shaking. Add 20 ml. of petroleum ether (60° to 80°) and titrate with N/10 NaOH to the same blue colour as before, shaking vigorously during the titration. Run a blank, omitting the dioxan. The difference between the two titrations should not exceed 1.7 ml.

8 **Peroxide.**—Add 5 ml. to 10 ml. of potassium iodide solution and 5 ml. of dilute hydrochloric acid, mix and add 1 ml. of starch solution. Any blue or brown colour produced should be completely discharged by the addition of 0.05 ml. of N/10 $\text{Na}_2\text{S}_2\text{O}_3$.

* It is dangerous to determine the boiling range of samples that do not comply with Test No. 8 for peroxide.

DIOXAN (Diethylene dioxide)—continued

9 **Water.**—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 80 mg of water.

ANALAR DIPHENYLAMINE



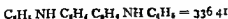
Maximum Limits of Impurities

Sulphated Ash	0.02 per cent
Nitrate	no reaction

Sensitivity to Nitrate (NO_3) : 160,000 minimum

- 1 **Description**—White crystals with a characteristic odour
- 2 **Solubility**—Readily soluble in ether. Dissolve 1 g in 50 ml of 90 per cent ethyl alcohol, a clear colourless solution should be produced
- 3 **Melting Point**— 54° to 55°
- 4 **Sulphated Ash**—Moisten 2.5 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left
- 5 **Nitrate**—Dilute 6 ml of sulphuric acid with 2 ml of water, cool to about 60° and add 1 drop of hydrochloric acid and 1 mg of the diphenylamine. No blue colour should be produced
- 6 **Sensitivity**—To the solution produced in Test No. 5 add 0.2 ml of $\text{M}/10,000 \text{ KNO}_3$ ($= 0.001 \text{ mg NO}_3$) and allow to stand for 5 minutes. A blue colour should be produced

ANALAR DIPHENYLBENZIDINE



Maximum Limits of Impurities

Sulphated Ash	0.1 per cent
Nitrate	no reaction

Sensitivity to Nitrate (NO_3) : 5,000,000 minimum

- 1 **Description.**—White to faintly grey or buff crystalline powder.
- 2 **Melting Point.**— 246° to 250°
- 3 **Sulphated Ash.**—Moisten 0.5 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left
- 4 **Nitrate.**—Dissolve 8 mg in a cooled mixture of 45 ml of sulphuric acid, nitrogen free, and 5 ml of water. The solution should be colourless or only very faintly blue
5. **Sensitivity to Nitrate.**—To 2.5 ml of $M/300,000$ KNO_3 solution add 1.5 ml of the solution prepared in Test No. 4 followed by 6 ml of nitrogen-free sulphuric acid, and mix. A definite blue colour should be observed on comparing with a solution containing 2.5 ml of water, 1.5 ml of the reagent solution and 6 ml of nitrogen-free sulphuric acid

ANALAR

sym-DIPHENYLCARBAZIDE



Maximum Limit of Impurity

Sulphated Ash 0.05 per cent

Sensitivity to Chromate (CrO_4) 1 : 5,000,000 minimum

- 1 **Description.**—White to cream coloured crystalline powder slowly becoming pink on exposure to air
- 2 **Solubility.**—Almost insoluble in water. Dissolve 2 g in 50 ml of 95 per cent alcohol. A clear solution, not more than faintly yellow, should be produced
- 3 **Melting Point.**— 165° to 169°
- 4 **Sulphated Ash.**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left
- 5 **Sensitivity to Chromate.**—Dilute 0.5 ml of $N/10$ $K_2Cr_2O_7$ with water to 1 litre. Dilute 5 ml of this solution to 50 ml and add 3 drops of dilute hydrochloric acid and 0.5 ml of a solution of the diphenylcarbazide made by dissolving 0.2 g in 10 ml of acetic acid and diluting to 100 ml with water. The colour produced within 5 minutes should be reddish violet when compared with a solution containing 50 ml of water, 3 drops of dilute hydrochloric acid and 0.5 ml of the diphenylcarbazide solution

ANALAR

DIPHENYLTHIOCARBAZONE

(Dithizone)



Maximum Limits of Impurities

Sulphated Ash	0.2 per cent
Lead (Pb)	0.1 per cent

Sensitivity to Lead (Pb) 1 : 20 000 000 minimum

1 **Description**—Purple black crystalline powder

2 **Solubility**—Dissolve 0.1 g in 10 ml of chloroform filter through asbestos in a Gooch crucible and wash with a further 15 ml of chloroform. Not more than a trace of dark insoluble matter should remain. Dilute the filtrate to 100 ml with chloroform and use this solution for Tests Nos 4 and 5.

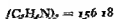
3 **Sulphated Ash**—Moisten 0.5 g with sulphuric acid in a silica crucible and ignite gently. Not more than 1 mg of residue should remain.

4 **Lead**—Shake 5 ml of the solution from Test No. 2 with a mixture of 5 ml of water, 2 ml of potassium cyanide solution and 2 ml of strong ammonia solution. Dilute the chloroform layer with 5 ml of chloroform and wash with a mixture containing 5 ml of water, 1 ml of dilute ammonia solution and 1 ml of potassium cyanide solution. The chloroform layer may remain yellow but should have no red tint.

5 **Sensitivity to Lead**—Dilute 1 ml of the solution from Test No. 2 with chloroform to 25 ml. Add 2 ml of this solution to a mixture of 0.05 ml of standard lead solution (1 ml = 0.01 mg Pb), 10 ml of water, 1 ml of potassium cyanide solution and 2 drops of dilute ammonia solution and shake in a glass stoppered tube. A distinct pink colour should be obtained in the chloroform layer as compared with a blank experiment from which the lead is omitted.

ANALAR

αα-DIPYRIDYL



Maximum Limit of Impurity

Sulphated Ash	0.25 per cent
---------------	---------------

Sensitivity to Iron (Fe) 1 : 10 000 000 minimum

1 **Description**—White or faintly coloured crystalline powder

2 **Solubility.**—Almost insoluble in water. Dissolve 1 g in 10 ml of cold N/1 hydrochloric acid and dilute to 100 ml with water. A clear colourless solution should be obtained.

3 **Melting Point.**—68° to 70°

4 **Sulphated Ash.**—Moisten 0.2 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should remain.

5 **Sensitivity to Iron.**—Add 0.5 ml of the solution prepared in Test No. 2 to a mixture of 10 ml of water, 0.1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 ml of hydroxylamine hydrochloride solution (10 per cent). The colour produced should be definitely pink when compared with a solution containing the same quantities of reagents but omitting the iron solution.

ANALAR ESCHKA'S MIXTURE

A mixture of 1 part by weight of sodium carbonate (anhydrous)
and 2 parts by weight of magnesium oxide

Maximum Limit of Impurity

Sulphate (SO_4) . . .	0.01 per cent
----------------------------------	---------------

1 **Description.**—A white powder

2. **Sulphate.**—Dissolve 2 g in 25 ml of water and 25 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

ANALAR ETHER

$(\text{C}_2\text{H}_5)_2\text{O} = 74.12$

Maximum Limits of Impurities

Acidity (SO_4)	0.0001 per cent
Non-volatile Matter	0.001 per cent
Aldehyde, Acetone and Vinyl Compounds (CH_3CHO)	0.0002 per cent
Ether Peroxide	0.000015 per cent (0.15 part per million)
Water	0.4 per cent

1 **Description.**—A clear colourless mobile liquid with a characteristic odour.

(Continued overleaf)

ETHER—continued

2 **Solubility.**—Soluble in about 10 parts of water Miscible with alcohol in all proportions

3 **Weight per ml. at 20°.**—0.713 to 0.715 g

4 **Refractive Index**— n_D^{20} 1.350 to 1.353

5 **Boiling Range.***—Not less than 95 per cent should distil between 34° and 35°

6 **Non-volatile Matter ***—Evaporate 70 ml to dryness on a water-bath Not more than 0.5 mg of residue should be left

7 **Acidity**—Heat 20 ml with 5 ml of neutral distilled water on a water-bath until the ether has evaporated, continue to heat for a further 5 minutes, then add 0.2 ml of neutral methyl red solution and compare the resulting colour with 5 ml of the same water to which 0.2 ml of neutral methyl red solution has been added The colour should not show any change towards red

8 **Aldehyde, Acetone and Vinyl Compounds**—Place 5 ml of Nessler's reagent in a stoppered bottle of 30 ml capacity and fill the bottle completely with the sample of ether, insert the stopper, shake well and allow to stand for 5 minutes No colour or turbidity should be produced

9 **Ether Peroxide**—Place 10 ml of ferrous thiocyanate reagent † in a 30 ml stoppered bottle previously filled with carbon dioxide, completely fill the bottle with the sample of ether, insert the stopper so that no bubble of air is enclosed shake vigorously and allow to stand in the dark for 5 minutes No distinct pink colour should be produced

10 **Water**—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 80 mg of water

* It is dangerous to determine boiling range and non volatile matter on samples that do not comply with Test No. 9 for peroxide

† **Ferrous Thiocyanate Reagent**—Dissolve 2 g of pure iron wire in 40 ml of dilute sulphuric acid and 260 ml of water decant the solution and mix with 6 g of potassium thiocyanate dissolved in 60 ml of air free water The reagent which should be colourless, may be stored in an atmosphere free from oxygen

ANALAR ETHYL ACETATE



Maximum Limits of Impurities

Non volatile Matter	0.0025 per cent
Free Acid	1.0 ml N/1 per cent
Organic Impurities	passes test
Water	0.2 per cent

- 1 **Description**—A clear colourless liquid with a characteristic odour
- 2 **Solubility**—Slightly soluble in water Miscible with alcohol and with ether
- 3 **Weight per ml at 20°**—0.900 to 0.902 g
- 4 **Refractive Index**— n_D^{20} 1.371 to 1.373
- 5 **Boiling Range**—Not less than 95 per cent should distil between 76.5° and 77.5°
- 6 **Non volatile Matter**—Evaporate 20 ml to dryness on a water bath Not more than 0.5 mg of residue should be left
- 7 **Free Acid**—Dissolve 1 g in 10 ml of neutral alcohol add 0.1 ml of phenolphthalein solution and titrate with N/10 KOH Not more than 0.1 ml of N/10 KOH should be required to produce a pink tint
- 8 **Organic Impurities**—Mix 2 ml with 2 ml of sulphuric acid keeping cool the while No dark colour should be produced
- 9 **Water**—Titrate 20 ml of methyl alcohol electrometrically with Karl Fischer reagent then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour had been established Immediately back titrate this excess, electrometrically with a standard solution of water in methyl alcohol The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 40 mg of water
- 10 **Assay**—Treat 2 g with 50 ml of N/1 NaOH and allow to stand for 30 minutes in a stoppered flask Titrate the excess of alkali with N/1 HCl using phenolphthalein as indicator

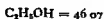
$$1 \text{ ml N/1 NaOH} = 0.08810 \text{ g CH}_3\text{COOC}_2\text{H}_5$$

Not less than 99 per cent should be indicated

ANALAR

ETHYL ALCOHOL

(99/100 per cent.)



Maximum Limits of Impurities

Acidity	0.05 ml N/1 per cent
Alkalinity	0.05 ml N/1 per cent
Non volatile Matter	0.0025 per cent
Aldehyde	0.005 per cent
Aldehydes and ketones $((\text{CH}_3)_2\text{CO})$	0.015 per cent
Methyl Alcohol	no reaction
Furfural	0.001 per cent
Fusel Oil	passes test
Tannin	passes test
Water	1.0 per cent

- Description**—A clear colourless liquid with a characteristic odour
- Solubility**—Miscible in all proportions with water forming clear colourless solutions
- Reaction**—Mix 10 ml with 10 ml of carbon dioxide free water, the solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so
- Specific Gravity** (15.5°/15.5°)—0.794 to 0.797 (corresponding to 100 to 99.3 per cent. v/v of ethyl alcohol or 100 to 98.9 per cent w/v)
- Refractive Index**— n_D^{20} 1.3610 to 1.3620
- Boiling Range**—Not less than 95 per cent should distil between 77.5° and 78.5°
- Non-volatile Matter**—Evaporate 25 ml to dryness on a water-bath. Not more than 0.5 mg of residue should be left
- Aldehyde**.—Mix at 15° 1 ml with 1 ml of Schiff's reagent allow to stand at 15° for 10 minutes and then add 4 ml of water. The colour when viewed through a depth of 2.5 cm should not be deeper than 3.5 red + 1.0 blue (Lovibond scale)
- Aldehydes and Ketones**—Mix in a stoppered cylinder 25 ml with 25 ml of water and 50 ml of hydroxylamine hydrochloride reagent, allow to stand for 5 minutes and titrate with N/10 NaOH to the same green colour as shown by 50 ml of the reagent contained in a similar cylinder both being viewed down the axes of the cylinders. Not more than 0.5 ml of N/10 NaOH should be required
- Methyl Alcohol**—Dilute 0.5 ml with water to 5 ml and add 2.0 ml of a solution prepared by dissolving 3 g of potassium perman

ganate in a mixture of 15 ml of phosphoric acid and 70 ml of water and diluting with water to 100 ml. Allow to stand for 10 minutes and decolorise by the addition of 2.0 ml of a 5 per cent v/v solution of oxalic acid in a cooled mixture of equal volumes of sulphuric acid and water. Add 5 ml of Schiff's reagent and allow to stand for 30 minutes. The solution should remain colourless.

11 **Furfural**.—Mix 10 ml with 0.05 ml of aniline and 0.25 ml of glacial acetic acid and allow to stand for 2 hours. No red colour should be produced.

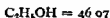
12 **Fusel Oil**.—Mix 5 ml with 0.5 ml of glycerin, pour on to a piece of filter paper and allow to evaporate spontaneously. No foreign odour should be perceptible at any stage of the evaporation.

13 **Tannin**.—(a) Mix 10 ml with 5 ml of dilute ammonia solution. No immediate darkening should be produced.

(b) Mix 10 ml with 5 ml of sodium hydroxide solution. No immediate darkening should be produced.

14 **Water**.—Titrate 10 g with Karl Fischer reagent until a small excess is present and a permanent iodine colour is established. Back titrate this excess, electrometrically with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used should be equivalent to not more than 100 mg of water.

ANALAR ETHYL ALCOHOL (90 per cent.)



Maximum Limits of Impurities

Acidity	0.05 ml N/1 per cent
Alkalinity	0.05 ml N/1 per cent
Non volatile Matter	0.0025 per cent
Aldehyde	0.005 per cent
Aldehydes and ketones ($(\text{CH}_3)_2\text{CO}$)	0.015 per cent
Methyl Alcohol	no reaction
Furfural	0.001 per cent.
Fusel Oil	passes test
Tannin	passes test

Specific Gravity (15.5°/15.5°)—0.832 to 0.835 (corresponding to 90.5 to 89.6 per cent v/v of ethyl alcohol or 86.3 to 85.2 per cent w/w)

Other Tests.—The alcohol should conform to Tests Nos. 1, 2, 3, 7, 8, 9, 10, 11, 12 and 13 of Ethyl Alcohol (99/100 per cent.)

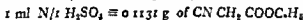
ANALAR ETHYL CYANOACETATE



Maximum Limits of Impurities

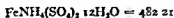
Free Acid	2.0 ml of N/1 per cent
Non-volatile Matter	0.02 per cent

- 1 **Description**.—An almost colourless liquid
- 2 **Solubility**.—Insoluble in water. Miscible with alcohol and with ether, to give clear colourless solutions
- 3 **Free Acid**.—Shake 2 g with 50 ml of carbon dioxide-free water and titrate with N/10 NaOH, using phenolphthalein as indicator. Not more than 0.4 ml of N/10 NaOH should be required to produce a pink tint
- 4 **Weight per ml at 20°**.—1.060 to 1.064 g
- 5 **Refractive Index**.— n_D^{20} 1.413 to 1.423
- 6 **Non-volatile Matter**.—Evaporate 5 ml to dryness and ignite gently. Not more than 1 mg of residue should be left
- 7 **Assay**.—To 2 g add 50 ml of water and 50 ml of sodium hydroxide solution and distil slowly into 50 ml of N/1 sulphuric acid. Titrate the excess of acid with N/1 NaOH using methyl red as indicator



Not less than 94 per cent should be indicated

ANALAR FERRIC AMMONIUM SULPHATE (Iron Alum)



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Ferrous Salt	no reaction

- 1 **Description**.—Pale violet or almost colourless crystals or crystalline powder
- 2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear pale brown solution should be produced
- 3 **Chloride**.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

4 **Ferrous Salt**—Dissolve 1 g in 20 ml of water and add 2 ml of dilute hydrochloric acid and 1 drop of potassium ferricyanide solution. No blue or green colour should be produced.

5 **Assay**.—Dissolve 2 g in 100 ml of water, add 3 ml of nitric acid, heat to boiling and add a slight excess of ammonia solution. Filter, wash the precipitate with hot water until free from sulphate, dry, ignite and weigh the resulting ferric oxide.

Weight of $\text{Fe}_2\text{O}_3 \times 6.040 = \text{weight of } \text{FeNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$

Not less than 99 per cent and not more than 101 per cent should be indicated.

ANALAR

FERRIC CHLORIDE (HYDRATED)

$\text{FeCl}_3 \cdot 6\text{H}_2\text{O} = 270.32$

Maximum Limits of Impurities

Free Chlorine (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.004 per cent
Ferrous Salt (Fe)	0.03 per cent
Copper (Cu)	0.0025 per cent
Lead (Pb)	0.005 per cent
Zinc (Zn)	0.01 per cent
Manganese (Mn)	0.1 per cent
Alkalis (Na)	0.05 per cent
Arsenic (As_2O_3)	0.0005 per cent
(5 parts per million)	

1 **Description**—Brownish yellow deliquescent masses.

2 **Solubility**—Dissolve 10 g in 10 ml of water. The solution should not be more than slightly turbid and, on heating to boiling with 0.2 ml of hydrochloric acid, should become clear.

3 **Free Chlorine**—Boil 5 g with 10 ml of water and expose starch iodide paper to the vapours. No blue colour should be produced.

4 **Sulphate**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 5 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Nitrate**—Dissolve 2 g in 20 ml of water, add 10 ml of dilute ammonia solution and filter by suction. To 15 ml of the filtrate add 5 ml of dilute sulphuric acid, 1 ml of standard indigo solution and 20 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Phosphate**—Boil 2 g with 2 ml of nitric acid and 2 ml of

FERRIC CHLORIDE (HYDRATED)—*continued*

water, cool, add 20 ml of water and 10 ml of ammonium nitro-molybdate solution and maintain at 40° for 2 hours. No yellow precipitate should be produced.

7 Ferrous Salt.—Dissolve 2 g in 100 ml of water, add 2 ml of phosphoric acid and titrate with N/10 KMnO_4 using a micro-burette. Carry out a blank determination, omitting the ferric chloride. The difference between the two titrations should not exceed 0.10 ml.

8 Preparation of Solution for Copper, Lead, Zinc, Manganese and Alkalies Tests.—Dissolve 10 g in 10 ml of water and 17 ml of hydrochloric acid, add 2 drops of hydrogen peroxide (20 volumes) and shake with four successive 20 ml portions of ether. Evaporate the acid solution to dryness, dissolve the residue in 2 ml of dilute hydrochloric acid and 10 ml of water, filter if necessary, and dilute with water to 100 ml.

9 Copper.—In 20 ml of solution 8 dissolve 1 g of citric acid, add 5 ml of dilute ammonia solution and 1 ml of a 0.1 per cent aqueous solution of sodium diethyldithiocarbamate and shake with three successive portions, 5 ml, 3 ml and 2 ml of carbon tetrachloride. Mix the carbon tetrachloride extracts and dry with a little anhydrous sodium sulphate. Any colour produced should not be greater than that obtained by treating 15 ml of water and 5 ml of standard copper solution (1 ml = 0.01 mg Cu) in the same manner.

10 Lead.—In 20 ml of solution 8 dissolve 1 g of citric acid, add 5 ml of dilute ammonia solution and 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be greater than that produced by adding 2 drops of sodium sulphide solution to 50 ml of a solution containing 1 g of citric acid, 5 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 10 ml of standard lead solution (1 ml = 0.01 mg Pb).

11 Zinc.—In 10 ml of solution 8 dissolve 1 g of citric acid, add 0.1 g of resorcinol and adjust the reaction of the solution with dilute ammonia solution to approximately pH 9.0, using thymol blue as indicator. Shake vigorously with three successive 5 ml portions of a 0.1 per cent solution of dithizone in chloroform. Mix the chloroform solutions, wash with 5 ml of water and then shake with 10 ml of N/1 HCl. Separate and wash the acid liquid with 5 ml of chloroform, transfer to a Nessler glass, add 1 g of ammonium chloride, dilute with water to 50 ml, add 1 ml of potassium ferrocyanide solution and allow to stand for 15 minutes. Any turbidity produced should not be greater than that produced by adding 1 ml of potassium ferrocyanide solution to 50 ml of solution containing 10 ml of N/1 HCl, 1 g of ammonium chloride and 10 ml of standard zinc solution (1 ml = 0.01 mg Zn) and allowing to stand for 15 minutes*.

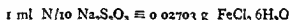
*It is essential that the potassium ferrocyanide solution be added to the test and comparison solutions at the same time.

12 Manganese.—To 10 ml of solution 8 add 1 ml of sulphuric acid and evaporate until all hydrochloric acid is removed. Cool, add 25 ml of water, 15 ml of nitric acid and 0.5 g of sodium bismuthate, shake occasionally during 5 minutes, dilute with water to 100 ml and allow to stand until clear or filter through asbestos or sintered glass. Any pink colour produced should not be greater than that produced by the addition of 0.9 ml of N/10 KMnO_4 to 100 ml of water.

13 Alkalis.—Evaporate 35 ml of solution 8 to 10 ml, add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 . Mix, add 5 ml of ammonium thiocyanate solution and extract with two 10 ml portions of a mixture of equal volumes of amyl alcohol and amyl acetate. Evaporate the aqueous layer to dryness, moisten with sulphuric acid, ignite and weigh. Not more than 5 mg should be obtained.

14 Arsenic.—Dissolve 1 g in 18 ml of 20 per cent hydrochloric acid, add stannous chloride solution until the iron is completely reduced as shown by the colour of the solution. Distil 15 ml, to the distillate add 40 ml of water and 5 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

15 Assay.—Dissolve 5 g in sufficient water to produce 100 ml, to 20 ml of this solution add 10 ml of water, 25 ml of hydrochloric acid and 3 g of potassium iodide, allow to stand for 3 minutes and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$.



Not less than 98 per cent should be indicated.

ANALAR

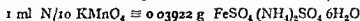
FERROUS AMMONIUM SULPHATE



1 Description.—Pale greenish blue crystals or a crystalline powder.

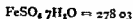
2 Solubility.—Dissolve 5 g in 52 ml of freshly boiled and cooled water. An almost clear, pale yellowish-green solution should be produced.

3 Assay.—Dissolve 1.5 g in 50 ml of freshly boiled and cooled water and 20 ml of dilute sulphuric acid and titrate with N/10 KMnO_4 .



Not less than 99 per cent and not more than 100.5 per cent should be indicated.

ANALAR FERROUS SULPHATE



Maximum Limits of Impurities

Free Acid	1.0 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Lead (Pb)	0.0025 per cent
Copper (Cu)	0.002 per cent
Zinc (Zn)	0.01 per cent
Manganese (Mn)	0.03 per cent
Alkalis and other Metals (Na)	0.03 per cent
Arsenic (As_2O_3)	0.00005 per cent
	(0.5 part per million)

1 **Description**—Green or bluish green crystals or crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of freshly boiled and cooled water. A pale yellowish green solution should be produced which should not be more than faintly turbid.

3 **Free Acid**—Dissolve 5 g in 50 ml of freshly boiled and cooled water and titrate with N/10 NaOH using methyl orange as indicator. Not more than 0.5 ml of N/10 NaOH should be required to produce a yellow colour.

4 **Chloride**—Dissolve 2 g in 45 ml of water and add 2 ml of dilute nitric acid, 3 ml of hydrogen peroxide (20 volumes) and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Polarographic Tests for Lead, Copper and Zinc. General Directions**—Dissolve 30 g in water and dilute to 150 ml. Each aliquot after the specified additions and before being polarographed must be freed from oxygen by the passage of a stream of hydrogen for 5 minutes. In each test 2 volts instead of the normal 4 volts should be applied.

6 **Lead**—To 50 ml of solution 5 add 44 ml of water, 1 ml of a 0.25 per cent solution of gelatine and 5 ml of a 2 per cent solution of citric acid. Polarograph over the range -0.4 volt to -0.8 volt. Return the solution in the polarographic cell together with the mercury, to the solution under test, add 0.25 ml of standard lead solution (1 ml = 1 mg Pb), mix well and polarograph as before. The wave height in the first experiment should not be greater than the increase in height obtained in the second experiment.

7 **Copper**—To 50 ml of solution 5 add 20 ml of water, 10 ml of a 5 per cent solution of hydroxylamine hydrochloride and 2 ml of dilute hydrochloric acid. Heat to boiling and while still warm add 2 g of

potassium thiocyanate cool, add 1 ml of a 0.25 per cent solution of gelatine and dilute with water to 100 ml. Polarograph 15 ml over the range -0.25 volt to -0.5 volt. Return the solution in the polarographic cell, together with the mercury, to the solution under test, add 0.2 ml of standard copper solution (1 ml = 1 mg Cu) and the volume of standard lead solution (1 ml = 1 mg Pb) equivalent to the amount of lead found in Test No. 5, mix well and polarograph as before. The wave height in the first experiment should not be greater than the increase in height obtained in the second experiment.

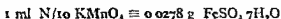
8 Zinc.—To 5 ml of solution 5 add 90 ml of water and 5 ml of a 2 per cent solution of citric acid. Polarograph over the range -0.9 volt to -1.3 volt. Return the solution in the polarographic cell together with the mercury, to the solution under test, add 0.1 ml of standard zinc solution (1 ml = 1 mg Zn) mix well and polarograph as before. The wave height in the first experiment should not be greater than the increase in height obtained in the second experiment.

9 Manganese.—Dissolve 0.5 g in 40 ml of water and 10 ml of nitric acid add 1 g of sodium bismuthate, shake occasionally during 5 minutes and allow to stand until clear or filter through asbestos or sintered glass. Any pink colour produced should not be greater than that obtained by adding 1.35 ml N/100 KMnO_4 to 50 ml of a solution prepared by boiling 0.5 g of ferrous sulphate with 10 ml of nitric acid and 20 ml of water until oxides of nitrogen cease to be evolved, cooling and diluting with water.

10 Alkalis and other Metals.—Dissolve 2.5 g in 9 ml of water and 6 ml of dilute hydrochloric acid and add 1 ml of hydrogen peroxide (100 vols) and 20 ml of hydrochloric acid and extract with four 20 ml portions of ether with vigorous shaking. Evaporate the ether from the aqueous layer on the water bath and concentrate to 1 ml. Dilute with 10 ml of water, add 1 ml of dilute hydrochloric acid and 5 ml of ammonium thiocyanate solution and extract with two 10 ml portions of a mixture of equal volumes of amyl alcohol and amyl acetate. Evaporate the acid layer to dryness and ignite gently. Not more than 2 mg of residue should be left.

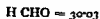
11 Arsenic.—Dissolve 4 g in 20 ml of 20 per cent hydrochloric acid, add a few drops of stannous chloride solution and distil 15 ml. To the distillate add a few drops of bromine solution remove the excess of bromine by a few drops of stannous chloride solution, add 50 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain.

12 Assay.—Dissolve 1 g in 50 ml of freshly boiled and cooled water and 20 ml of dilute sulphuric acid and titrate with N/10 KMnO_4



Not less than 99 per cent should be indicated

ANALAR FORMALDEHYDE SOLUTION



Maximum Limits of Impurities

Acidity	3.0 ml N/1 per cent
Non volatile Matter	0.0025 per cent
Chloride (Cl)	0.0002 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Organic Impurities	passes test

1 Description—A solution of formaldehyde in water, containing about 36 per cent of formaldehyde and about 10 per cent of methyl alcohol. A colourless liquid with a strong pungent odour clear when issued. On keeping a white precipitate of polymerised formaldehyde may separate.

2 Solubility—Miscible with water and with alcohol forming clear colourless solutions.

3 Acidity—Dilute 10 ml with 10 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator. Not more than 0.3 ml should be required.

4 Non-volatile Matter—Evaporate 20 ml to dryness and ignite gently. Not more than 0.5 mg of residue should be left.

5 Chloride—Dilute 5 ml with 45 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

6 Heavy Metals and Iron—Dilute 5 ml with 40 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 Organic Impurities—Mix 10 ml with 10 ml of N/1 NaOH and allow to stand for 1 hour. No colour should be produced.

8 Assay—Mix 3 ml with 50 ml of N/1 NaOH and add 25 ml of hydrogen peroxide (20 volumes). Warm on a water bath for 30 minutes with occasional shaking. Cool and titrate the excess of alkali with N/1 HCl using phenolphthalein as indicator. Carry out a blank determination omitting the formaldehyde solution.

Each ml difference between the titrations corresponds to 1 per cent w/v H CHO.

Not less than 36 per cent w/v should be indicated.

ANALAR
FORMIC ACID
(98/100 per cent.)



Maximum Limits of Impurities

Non-volatile Matter	0.01 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent

- 1 **Description**—A clear colourless liquid with a pungent odour
- 2 **Solubility**.—Miscible with water in all proportions forming clear colourless solutions which should not show any turbidity on standing
- 3 **Weight per ml. at 20°**.—1.218 to 1.221 g
- 4 **Freezing Point**.—Not below 4°
- 5 **Non-volatile Matter**.—Evaporate 8 ml to dryness on a water-bath. Not more than 1 mg of residue should be left
- 6 **Chloride**.—Dilute 8 ml with 40 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2
- 7 **Sulphate**.—To 8 ml add 0.2 ml of N/1 Na_2CO_3 and evaporate to dryness on a water bath, dissolve the residue in 10 ml of water and 1 ml of N/1 HCl filter if necessary, and add 1 ml of barium chloride solution. Any turbidity produced should not be greater than the "standard turbidity" defined in appendix 2
- 8 **Heavy Metals and Iron**.—Dilute 2 ml with 35 ml of water, add 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2
- 9 **Assay**.—Dilute 2 g with 25 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator
 $1 \text{ ml N/1 NaOH} \equiv 0.04603 \text{ g H COOH}$
 Not less than 98 per cent should be indicated

ANALAR FORMIC ACID (90 per cent.)



Maximum Limits of Impurities

Non volatile Matter	0.01 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent

1 Description —A clear colourless liquid with a pungent odour.

2 Solubility —Miscible with water in all proportions forming clear colourless solutions which should not show any turbidity on standing

3 Weight per ml at 20° —1.202 to 1.207 g

4-8 Tests for Non-volatile Matter, Chloride, Sulphate, Heavy Metal and Iron, and Assay are carried out as described for Formic Acid (98/100 per cent)

8 Assay —Not less than 89.5 per cent should be indicated

ANALAR FUSION MIXTURE

An equimolecular mixture of anhydrous potassium and sodium carbonates

Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.001 per cent
Silicate (SiO_2)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent (1 part per million)
Moisture	2.0 per cent

1 Description —A white powder or granules

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride.**—Dissolve 2 g in 40 ml of water and add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 **Sulphate.**—Dissolve 5 g in 100 ml of water, add 20 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Nitrate.**—Dissolve 1 g in 10 ml of dilute sulphuric acid, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Phosphate.**—Dissolve 2 g in 10 ml of water in a platinum dish and neutralise with dilute sulphuric acid (about 4 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder of the solution for Test No. 7) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

7 **Silicate.**—To 2 ml of the solution retained from Test No. 6 add 20 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

8 **Heavy Metals and Iron.**—Dissolve 1 g in 5 ml of dilute hydrochloric acid, add 40 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

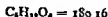
9 **Arsenic.**—Dissolve 5 g in 50 ml of water, add 16 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

10 **Moisture.**—Dry 3 g at about 300° for 15 minutes. The loss in weight should not exceed 60 mg.

ANALAR

D-GLUCOSE

(Dextrose)



Maximum Limits of Impurities

Alcohol insoluble Matter	ml
Acidity	0.3 ml N/1 per cent
Sulphated Ash	0.04 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO ₄)	0.005 per cent
Sulphate (SO ₃)	0.0005 per cent
Heavy Metals (Pb)	0.0002 per cent
Iron (Fe)	0.0001 per cent
Arsenic (As ₂ O ₃)	0.00002 per cent
	(0.2 part per million)
Moisture	0.2 per cent

1 Description—A white crystalline or granular powder

2 Solubility—Dissolve 5 g in 50 ml of water a clear colourless solution should be produced. Dissolve 1 g in 30 ml of boiling 90 per cent ethyl alcohol a clear solution should be formed which should not deposit on cooling

3 Acidity—Dissolve 10 g in 100 ml of hot carbon dioxide free water and titrate with N/10 NaOH using phenolphthalein as indicator. Not more than 0.3 ml of N/10 NaOH should be required

4 Specific Rotation— $[\alpha]_D^{20}$ not less than $+52^\circ$ determined on a 10 per cent w/v well boiled aqueous solution

5 Sulphated Ash—Moisten 5 g with sulphuric acid and ignite gently, again moisten with sulphuric acid and reignite. Not more than 2 mg of residue should be left

6 Chloride—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2

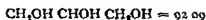
7 Sulphate—Dissolve 2 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

8 Heavy Metals and Iron—Dissolve 10 g in 40 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2

9 **Arsenic and Sulphite**—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain. The lead paper used in the test should not show any more darkening than that used in the preparation of the standard stain.

10 **Moisture**—Dry 5 g at 110° for 1 hour. The loss in weight should not exceed 10 mg.

ANALAR GLYCEROL



Maximum Limits of Impurities

Ash	0.01	per cent
Chloride (Cl)	0.0002	per cent
Sulphate (SO_4)	0.001	per cent
Fatty Acids	passes test	
Esters of Volatile Fatty Acids (Glyceryl Tributyrates)	0.025	per cent
Heavy Metals (Pb)	0.0001	per cent
Iron (Fe)	0.00005	per cent
Sugars	no reaction	
Reducing Substances	no reaction	
Organic Impurities	passes test	
Arsenic (As_2O_3)	0.0002	per cent
	(2 parts per million)	

1 **Description**—A clear colourless syrupy liquid.

2 **Solubility**—Miscible with water and with alcohol forming clear colourless solutions.

3 **Reaction**—The reaction of a solution of 2 ml in 10 ml of carbon dioxide free water should be neutral to litmus paper.

4 **Weight per ml at 20°**—1.255 to 1.260 g corresponding to 98 to 100 per cent of $\text{C}_3\text{H}_8(\text{OH})_3$.

5 **Refractive Index**— n_D^{20} not less than 1.4696.

6 **Ash**—Ignite 20 g in a platinum dish. Not more than 2 mg of residue should be left and in dissipating the last traces of glycerol not more than a slight charring should occur and there should be no odour of burnt sugar.

7 **Chloride**—Dissolve 4 ml in 45 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

8 **Sulphate**—Dissolve 8 ml in 40 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

(Continued overleaf)

GLYCEROL—continued

9 **Fatty Acids.**—Warm 5 ml with 5 ml of dilute sulphuric acid to about 70° and shake vigorously. Not more than a faint unpleasant odour should be produced

10 **Esters of Volatile Fatty Acids.**—Mix 16 ml with 90 ml of carbon dioxide-free water and 2 ml of sodium hydroxide solution (50 per cent w/w) and boil for 2 minutes, add 10 ml of dilute sulphuric acid and 40 ml of carbon dioxide-free water and distil 110 ml. Titrate the distillate with N/10 NaOH using phenolphthalein as indicator. Not more than 0.5 ml of N/10 NaOH should be required

11 **Heavy Metals and Iron.**—Mix 16 ml with 30 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

12 **Sugars.**—Mix 5 ml with 5 ml of water and 1 ml of dilute sulphuric acid and heat in a boiling water bath for 5 minutes, then add 2 ml of sodium hydroxide solution and 5 ml of Fehling's solution and heat in the same manner for a further 10 minutes. No turbidity or precipitate should be produced

13 **Reducing Substances.**—Mix 5 ml with 5 ml of dilute ammonia solution, heat to 60° for 5 minutes, add 0.5 ml of silver nitrate solution and allow to stand in the dark for 10 minutes. No darkening should be produced

14 **Organic Impurities.**—(a) Mix 5 ml with 5 ml of sulphuric acid, keeping the mixture cold. The colour produced should not be deeper than pale yellow

(b) Mix 5 ml with 5 ml of sodium hydroxide solution and heat to 50° for 5 minutes. No yellow colour or unpleasant odour should be produced

15 **Arsenic.**—Mix 4 ml with 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

ANALAR**GUANIDINE CARBONATE****Maximum Limits of Impurities**

Sulphated Ash	0.2 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO ₄)	0.01 per cent

1 **Description.**—A white crystalline powder.

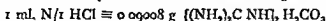
2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 2 mg of residue should be left.

4 **Chloride**—Dissolve 1 g in 50 ml of water and add 3 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Dissolve 1 g in 50 ml of water, add 3 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Assay**—Dissolve 4 g in 100 ml of boiling water and titrate with N/1 HCl to the full yellow colour of bromocresol green.



Not less than 99.8 per cent and not more than 100.2 per cent should be indicated.

ANALAR

HYDRAZINE SULPHATE



Maximum Limits of Impurities

Non volatile Matter	0.05 per cent
Chloride (Cl)	0.005 per cent
Heavy Metals (Pb)	0.004 per cent
Iron (Fe)	0.002 per cent
Arsenic (As ₂ O ₃)	0.0001 per cent
	(1 part per million)

1 **Description**—Colourless crystals.

2 **Solubility**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Non-volatile Matter**—Ignite 2 g gently, not more than 1 mg of residue should be left.

4 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than that given by 0.5 ml of standard chloride solution (1 ml = 0.1 mg Cl) in an equal volume of water containing the quantities of reagents used in the test.

5 **Heavy Metals and Iron**—Dissolve 0.5 g in 40 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

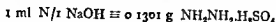
6 **Arsenic**—Dissolve 2 g in 20 ml of 20 per cent hydrochloric acid and 5 ml of water and distil 20 ml. To the distillate add 50 ml of water and a few drops of stannous chloride solution and test as described.

(Cont. next overleaf)

HYDRAZINE SULPHATE—*continued*

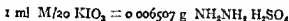
in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain

7 Assay.—(a) Dissolve 3 g in 200 ml of water and titrate with N/1 NaOH using methyl red as indicator



Not less than 99 per cent should be indicated

(b) Dissolve 0.3 g in 25 ml of water, add 20 ml of dilute hydrochloric acid and 5 ml of potassium cyanide solution and titrate with M/20 KIO₃ until the dark brown solution which is formed becomes light brown, then add 5 ml of starch solution and continue the titration until the blue colour disappears



Not less than 99 per cent should be indicated

ANALAR

HYDRIODIC ACID

(sp. gr. 1.94)

HI — 127.93

Maximum Limits of Impurities

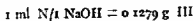
Non volatile Matter	0.1 per cent
Sulphur Compounds (SO ₂)	0.01 per cent

1 Description—A clear fuming liquid varying in colour from pale yellow to dark brown owing to the presence of free iodine

2 Non-volatile Matter.—Evaporate 5 g to dryness on a water-bath. Not more than 5 mg of residue should be left

3 Sulphur Compounds—Add 0.5 ml drop by drop to 5 ml of nitric acid and evaporate to dryness on a water bath. Dissolve the residue in 1 ml of dilute hydrochloric acid and 50 ml of water, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

4 Assay—Dilute 4 g with 25 ml of water, titrate any free iodine with N/10 Na₂S₂O₃, then titrate with N/1 NaOH using methyl red as indicator



Not less than 64 and not more than 68 per cent should be indicated

ANALAR

HYDRIODIC ACID

(sp. gr. 1.7)

$\text{HI} = 127.93$

Maximum Limits of Impurities

Non volatile Matter	0.02 per cent
Chloride and Bromide (Cl)	0.03 per cent
Sulphur Compounds (SO_2)	0.005 per cent
Phosphorus Compounds (PO_4)	0.0002 per cent

1 Description—A colourless liquid when freshly distilled, rapidly becomes yellow to reddish brown through liberation of iodine

2 Solubility—Miscible with water forming a clear solution

3 Non-volatile Matter—Evaporate 5 g to dryness on a water-bath. Not more than 1 mg of residue should be left

4 Chloride and Bromide—To 0.2 ml add 15 ml of water, 0.05 g of sodium sulphite, 5 ml of dilute ammonia solution and 20 ml of N/10 AgNO_3 shake and filter, to the filtrate add 10 ml of dilute nitric acid. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

5 Sulphur Compounds—Add 1 ml drop by drop to 5 ml of nitric acid and evaporate to dryness on a water bath. Dissolve the residue in 1 ml of dilute hydrochloric acid and 50 ml of water, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 Phosphorus Compounds—To the residue from Test No. 3 add 1 drop of nitric acid and evaporate to dryness on a water bath. Dissolve the residue in 3 ml of dilute sulphuric acid add 20 ml of water, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' for phosphate defined in appendix 2

7 Assay.—Dilute 5 g with 25 ml of water, titrate any free iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, then titrate with N/1 NaOH using methyl red as indicator

$1 \text{ ml N/1 NaOH} \equiv 0.1279 \text{ g HI}$

Not less than 54 and not more than 56 per cent should be indicated

ANALAR

HYDROBROMIC ACID

(sp. gr. 1.46 to 1.49)
46 to 48 per cent.

HBr = 80.92

Maximum Limits of Impurities

Non volatile Matter	0.02	per cent
Chloride (Cl)	0.1	per cent
Sulphur Compounds (SO ₄)	0.01	per cent
Phosphorus Compounds (PO ₄)	0.0002	per cent
Heavy Metals (Pb)	0.0004	per cent
Iron (Fe)	0.0002	per cent
Barium (Ba)	0.015	per cent
Arsenic (As ₂ O ₃)	0.0005	per cent
	(5 parts per million)	

1 **Description**—A clear colourless or pale yellow liquid

2 **Solubility**—Miscible with water and with alcohol forming clear solutions

3 **Non-volatile Matter**.—Evaporate 5 g. to dryness on a water-bath. Not more than 1 mg. of residue should be left

4 **Chloride**—Mix 10 g. with 70 ml. of water and 25 ml. of nitric acid, boil gently and pass a current of air through the liquid until all the liberated bromine is removed. Cool, add 10 ml. of N/10 AgNO₃, filter, wash with water and titrate the filtrate and washings with N/10 NH₄SCN using ferric ammonium sulphate as indicator. Not less than 7.0 ml. of N/10 NH₄SCN should be required

5 **Sulphur Compounds**—Add 1 ml. drop by drop to 5 ml. of nitric acid and evaporate to dryness on a water bath. Dissolve the residue in 1 ml. of dilute hydrochloric acid and 50 ml. of water, add 1 ml. of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 **Phosphorus Compounds**—To the residue from Test No. 3 add 1 drop of nitric acid and evaporate to dryness on a water bath. Dissolve the residue in 3 ml. of dilute sulphuric acid, add 20 ml. of water, 1 ml. of phosphate reagent No. 1 and 1 ml. of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" for phosphate defined in appendix 2

7 **Heavy Metals and Iron**—Dilute 5 g. with 25 ml. of water, add 20 ml. of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

8 Barium—Dilute 1 ml with 50 ml of water, add 1 ml dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

9 Arsenic—Dilute 2 g with 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

10 Assay—Dilute 5 g with 25 ml of water and titrate with N/1 NaOH using methyl red as indicator.

$$1 \text{ ml N/1 NaOH} = 0.08092 \text{ g HBr}$$

Not less than 46 per cent and not more than 48 per cent should be indicated.

ANALAR HYDROCHLORIC ACID (sp. gr. 1.18)

$$\text{HCl} = 36.465$$

Maximum Limits of Impurities

Non volatile Matter	0.0015	per cent
Free Chlorine (Cl)	0.0002	per cent
Sulphate (SO_4)	0.0003	per cent
Heavy Metals (Pb)	0.0002	per cent
Iron (Fe)	0.0001	per cent
Arsenic (As_2O_3)	0.000004	per cent
	(0.04 part per million)	

1 Description—A clear colourless fuming liquid.

2 Non-volatile Matter.—Evaporate 56 ml to dryness on a water-bath and ignite gently. Not more than 1 mg of residue should be left.

3 Free Chlorine—Dilute 2 ml with 20 ml of water, add 1 ml of cadmium iodide solution and 1 ml of starch solution and allow to stand in the dark for 10 minutes. No blue colour should be produced.

4 Sulphate—To 56 ml add 0.2 ml of N/1 Na_2CO_3 and evaporate to dryness on a water-bath, dissolve the residue in 10 ml of water and 1 ml of N/1 HCl filter if necessary, and add 1 ml of barium chloride solution. Any turbidity produced should not be greater than the 'standard turbidity' defined in appendix 2.

5 Heavy Metals and Iron—Dilute 10 ml with 15 ml of water, add 25 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

6 Arsenic.—Evaporate 42 ml on a water bath until reduced to 15 ml, keeping the liquid yellow by the addition, from time to time, of a

(Continued overleaf)

HYDROCHLORIC ACID (sp gr 1.18)—*continued*

few drops of bromine solution add 50 ml of water and a few drops of stannous chloride solution, and test as described in appendix 4 Any stain produced should not be greater than a 0.002 mg standard stain

7 Assay.—Dilute 4 g with 50 ml of water and titrate with N/1 NaOH using methyl red as indicator

1 ml N/1 NaOH \equiv 0.03646 g HCl

Not less than 35.4 per cent should be indicated

ANALAR HYDROFLUORIC ACID (40 per cent.)

HF \approx 20.01

Maximum Limits of Impurities

Non-volatile Matter	0.01	per cent
Chloride (Cl)	0.001	per cent
Sulphate (SO ₄)	0.004	per cent
Silica (SiO ₂)	0.2	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent

1 Description.—A clear colourless liquid

2 Non-volatile Matter.—Evaporate 10 g to dryness in a platinum dish, add 1 drop of sulphuric acid and ignite gently Not more than 1 mg of residue should be left

3 Chloride.—Dilute 1 g with 50 ml of water and add 1 ml of silver nitrate solution No opalescence should be produced

4 Sulphate.—To 5 g add 0.2 ml of N/1 Na₂CO₃ and evaporate to dryness on a water-bath, dissolve the residue in 10 ml of water and 1 ml of N/1 HCl, filter if necessary, and add 1 ml of barium chloride solution Any turbidity produced should not be greater than the "standard turbidity" defined in appendix 2

5 Silica.—Dilute 2 g with 10 ml of water in a platinum dish, add dilute ammonia solution until alkaline and boil off the excess, add 5 ml of a 20 per cent aqueous solution of potassium chloride and 10 ml of 90 per cent alcohol, allow to stand for 5 minutes and then transfer to a test-tube and examine immediately No turbidity should be produced

6 Heavy Metals and Iron.—Dilute 2 g with 35 ml of water, add 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds Any colour produced should not be deeper than the "standard colours" defined in appendix 2

7 Assay.—Dilute 15 g with 100 ml of water and titrate with N/1 NaOH using phenol red as indicator

1 ml of N/1 NaOH = 0.02001 g HF

Not less than 40 per cent should be indicated

ANALAR

HYDROGEN PEROXIDE

(20 volumes)
6 per cent w/v

$H_2O_2 = 34.016$

Maximum Limits of Impurities

Acidity	0.1 ml N/1 per cent
Non volatile Matter	0.005 per cent
Chloride (Cl)	0.0001 per cent
Sulphate (SO_4)	0.001 per cent
Phosphate (PO_4)	0.0002 per cent
Heavy Metals (Pb)	0.00004 per cent
Iron (Fe)	0.00003 per cent
Barium (Ba)	0.002 per cent
Arsenic (As_2O_3)	0.00001 per cent
	(0.1 part per million)

1 Description—A clear colourless liquid

2 Solubility—Miscible in all proportions with water and with alcohol

3 Acidity—Dilute 10 ml with 20 ml of water and titrate with N/10 NaOH using bromothymol blue as indicator Not more than 0.1 ml of N/10 NaOH should be required

4 Non-volatile Matter—Evaporate 20 ml to dryness and ignite gently Not more than 1 mg of residue should be left

5 Chloride—Dilute 10 ml with 40 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution No opalescence should be produced

6 Sulphate—Dilute 10 ml with 40 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour No turbidity or precipitate should be produced

7 Phosphate—Evaporate 5 ml to dryness dissolve any residue in 20 ml of water add 3 ml of dilute sulphuric acid 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes Any blue colour produced should not be deeper than the standard colour defined in appendix 2

(Continued overleaf)

HYDROGEN PEROXIDE (20 volumes)—continued

8 **Heavy Metals and Iron.**—To 50 ml add 0.1 g of sodium carbonate and evaporate to *complete dryness* on a water-bath. Dissolve the residue in 10 ml of water and 1 ml of dilute nitric acid, dilute with 35 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 **Barium.**—Dilute 10 ml with 40 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

10 **Arsenic.**—To 50 ml add 0.1 g of sodium carbonate and evaporate to *complete dryness* on a water-bath. Dissolve the residue in 50 ml of water and 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

11. **Assay.**—Dilute 1 ml with 20 ml of water, add 10 ml of dilute sulphuric acid and titrate with N/10 KMnO_4 .

$$1 \text{ mL N/10 KMnO}_4 \equiv 0.0017 \text{ g H}_2\text{O}_2 \\ \equiv 0.566 \text{ volume oxygen}$$

Not less than 6 per cent w/v (20 volumes) should be indicated

ANALAR
HYDROGEN PEROXIDE
(100 volumes)
30 per cent. w/v

$$\text{H}_2\text{O}_2 = 34.016$$

Maximum Limits of Impurities

Acidity	0.5 ml N/1 per cent
Non-volatile Matter	0.01 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.005 per cent
Phosphate (PO_4)	0.001 per cent
Heavy Metals (Pb)	0.0002 per cent
Iron (Fe)	0.0001 per cent
Barium (Ba)	0.01 per cent
Nitrogen (N)	0.005 per cent
Arsenic (As_2O_3)	0.00005 per cent
	(0.5 part per million)

1 **Description.**—A clear colourless liquid

2 **Solubility.**—Miscible in all proportions with water and with alcohol

3 **Acidity.**—Dilute 2 ml with 20 ml of water and titrate to a green

colour with N/10 NaOH using bromothymol blue as indicator. Not more than 0.1 ml. of N/10 NaOH should be required.

4. **Non-volatile Matter.**—Evaporate 10 ml. to dryness and ignite gently. Not more than 1 mg. of residue should be left.

5-10. **Tests for Chloride, Sulphate, Phosphate, Heavy Metals and Iron, Barium and Arsenic** are carried out as described for hydrogen peroxide (20 volumes) using in each case one-fifth of the specified amount of the sample.

11. **Nitrogen.**—To 5 ml. add a drop of sulphuric acid and evaporate on a steam bath to 2 ml. Transfer to a Kjeldhal flask with 10 ml of sulphuric acid, add 0.1 g. of sucrose and allow to stand for 30 minutes. Add 0.05 g. of cupric sulphate and 5 g. of potassium sulphate and digest until completely oxidised. Cool, dilute with water, add 60 ml. of 50 per cent sodium hydroxide solution, distil and collect the distillate in 10 ml. of N/100 H_2SO_4 and titrate the excess of acid with N/100 NaOH using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 1.8 ml.

12. **Assay.**—Dilute 5 ml. with water to 500 ml. To 20 ml of this solution add 10 ml of dilute sulphuric acid and titrate with N/10 $KMnO_4$.

$$1 \text{ ml N/10 } KMnO_4 \equiv 0.0017 \text{ g. } H_2O_2 \\ \equiv 0.566 \text{ volume oxygen.}$$

Not less than 29 per cent w/v (97 volumes) should be indicated.

ANALAR

HYDROXYLAMINE HYDROCHLORIDE



Maximum Limits of Impurities

Reaction	passes test
Sulphated Ash	0.05 per cent.
Sulphate (SO_4)	0.005 per cent.
Heavy Metals (Pb)	0.002 per cent.
Iron (Fe)	0.001 per cent
Ammonia	no reaction

1. **Description.**—Colourless crystals.

2. **Solubility.**—Soluble in alcohol. Dissolve 5 g in 50 ml of water; a clear colourless solution should be produced.

3. **Reaction.**—Dissolve 1 g. in 50 ml. of 90 per cent. alcohol, add 3 drops of dimethyl yellow solution and titrate to the full yellow colour with N/1 NaOH. Not more than 0.2 ml. should be required.

4. **Sulphated Ash.**—Moisten 2 g. with sulphuric acid and ignite gently; not more than 1 mg. of residue should be left.

(Continued overleaf)

HYDROXYLAMINE HYDROCHLORIDE—continued

5 **Sulphate**.—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**.—Dissolve 1 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Ammonia**.—Dissolve 1 g in 10 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible.

8 **Assay**.—Dissolve 0.3 g in water and make up to 250 ml. To 25 ml in a stoppered bottle add 50 ml of M/60 potassium bromate solution followed by 40 ml of dilute hydrochloric acid. Leave to stand for 15 minutes, add 3 g of potassium iodide and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.

$$1 \text{ ml M/60 KBrO}_3 = 0.01158 \text{ g NH}_2\text{OH HCl}$$

Not less than 98% per cent should be indicated.

ANALAR**8-HYDROXYQUINOLINE****Maximum Limits of Impurities**

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent

1 **Description**.—White or cream coloured crystals or crystalline powder.

2 **Solubility**.—Soluble in alcohol and in dilute ammonia forming clear solutions. One gram should dissolve in 20 ml of dilute acetic acid forming a clear yellow solution.

3 **Melting Point**.—74° to 76°.

4 **Sulphated Ash**.—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride**.—Dissolve 2 g in 45 ml of water and 5 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced.

6 **Sulphate**.—Dissolve 2 g in 45 ml of water and 5 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 Assay—Dissolve 0.15 g in 50 ml of water and 20 ml of dilute hydrochloric acid in a stoppered bottle. Add 1 drop of a 1 per cent aqueous solution of indigo carmine and titrate with N/10 bromide-bromate solution, with vigorous shaking, until almost all trace of green colour has disappeared. Stopper and allow to stand for 5 minutes. Add 80 ml of water and 10 ml of potassium iodide solution and titrate with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, using starch solution as indicator.

1 ml N/10 bromide bromate \equiv 0.003629 g $\text{C}_{16}\text{H}_8\text{N}_2\text{O}_8$

Not less than 99.5 per cent should be indicated.

ANALAR INDIGO CARMINE

$\text{C}_{16}\text{H}_8\text{O}_8\text{N}_2\text{S}_2\text{Na}_2 = 466.37$

Maximum Limits of Impurities

Insoluble Matter	0.2 per cent
Acidity	2.0 ml N/1 per cent
Alkalinity	2.0 ml N/1 per cent
Sulphated Ash	30 to 35 per cent
Moisture	10 per cent

1 Description—A deep blue powder or blue granules with a coppery lustre.

2 Solubility—Readily soluble in warm water forming a deep blue solution. Almost insoluble in alcohol. Dissolve 1 g in 100 ml of hot water. Filter through a Gooch crucible, wash with hot water, dry at 100° and weigh. Not more than 2 mg of residue should be obtained.

3 Reaction—Dissolve 1 g in 20 ml of hot water, add 5 g of sodium chloride, shake, cool, filter and dilute 10 ml of the filtrate with 10 ml of water. This solution should be neutral to methyl red or should require not more than 0.1 ml of N/10 HCl or N/10 NaOH to render it so.

4 Sulphated Ash—Moisten 0.5 g of the dried material from Test No. 5 with sulphuric acid and ignite. The residue should not be greater than 35 per cent and not less than 30 per cent.

5 Moisture—Dry 2 g at 100° for one hour. The loss in weight should not be greater than 200 mg.

6 Assay—Dissolve 0.5 g of the dried material from Test No. 5 in 150 ml of water and add 15 g of sodium hydrogen tartrate. Boil and titrate the hot solution, slowly with shaking, with N/10 TiCl_3 in an inert atmosphere until the deep blue colour changes to red brown.

1 ml N/10 $\text{TiCl}_3 \equiv$ 0.02332 g $\text{C}_{16}\text{H}_8\text{O}_8\text{N}_2\text{S}_2\text{Na}_2$

Not less than 90 per cent should be indicated.

ANALAR IODIC ACID

$\text{HIO}_3 = 175.93$

Maximum Limits of Impurities

Iodide	no reaction
Sulphated Ash	0.05 per cent
Sulphate (SO_4)	0.05 per cent

- 1 **Description** —White crystals or crystalline powder
- 2 **Solubility (Iodide)** —Dissolve 2 g in 20 ml of water. A clear colourless solution should be produced.
- 3 **Sulphated Ash** —Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.
- 4 **Sulphate** —Dissolve 1 g in 50 ml of water, add 1 g of hydroxyl amine hydrochloride and boil until free iodine is removed. Cool, dilute to 50 ml, add 0.5 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 15 minutes. No turbidity or precipitate should be produced.
- 5 **Assay** —Dissolve 0.1 g in 50 ml of water, add 3 g of potassium iodide and 10 ml of dilute hydrochloric acid and titrate the liberated iodine with $\text{N}/10 \text{ Na}_2\text{S}_2\text{O}_3$.



Not less than 99 per cent should be indicated.

ANALAR IODINE

$\text{I} = 126.92$

Maximum Limits of Impurities

Non volatile Matter	0.01 per cent
Chloride and Bromide (Cl)	0.005 per cent
Cyanide (CN)	0.005 per cent
Sulphate (SO_4)	0.01 per cent

- 1 **Description** —Bluish black crystalline scales with a metallic lustre.
- 2 **Solubility** —Almost insoluble in water. Dissolve 2.5 g in 25 ml of potassium iodide solution and add this to a solution of 5 g of sodium thiosulphate in 75 ml of water. A clear colourless solution should be produced.

3 **Non-volatile Matter.**—Ignite 10 g gently, not more than 1 mg of residue should be left

4 **Chloride and Bromide**—Triturate 5 g of the powdered material with 25 ml of water, allow to stand for 30 minutes and filter. Shake 10 ml of the filtrate with a little zinc filings until colourless, filter, add 1 ml of dilute ammonia solution and 1 ml of silver nitrate solution, again filter and to the clear filtrate add 40 ml of water and 2 ml of dilute nitric acid. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2

5 **Cyanide.**—Decolorise 10 ml of the aqueous extract from Test No 4 with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, add 1 drop of ammonium sulphide solution and evaporate on a water bath until the yellow colour is discharged, cool and add 0.2 ml of dilute hydrochloric acid and 1 drop of ferric chloride solution. No pink colour should be produced

6 **Sulphate**—Digest 1 g of the powdered material with 1 g of zinc powder and 5 ml of water until reduced. add 1 ml of dilute hydrochloric acid and 45 ml of water filter. add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

ANALAR

IODINE PENTOXIDE



Maximum Limits of Impurities

Iodide	no reaction
Sulphated Ash	0.2 per cent
Suitability for Gas Analysis	passes test

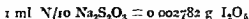
1 **Description**—White or slightly tinted granules free from the odour of chlorine

2 **Solubility (Iodide)**—Dissolve 1 g in 20 ml of water. A colourless solution which is not more than slightly hazy should be produced

3 **Sulphated Ash.**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 2 mg of residue should be left

4 **Suitability for Gas Analysis.**—Heat 10 g to 200° in a U tube contained in an oil bath and pass 1 litre of dry air through the U tube during 1 hour. Lead the issuing gases through a 10 per cent solution of potassium iodide, acidified with a few drops of hydrochloric acid and containing a few ml of starch solution. No blue colour should be produced

5 **Assay.**—Treat 0.15 g with 10 ml of potassium iodide solution and 20 ml of dilute hydrochloric acid. Titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$



Not less than 98 per cent should be indicated

ANALAR IODINE TRICHLORIDE

$\text{ICl}_3 = 233.29$

Maximum Limit of Impurity

Non volatile Matter

0.1 per cent

1 **Description**—Orange red crystalline masses with pungent irritating fumes

2 **Solubility**—Dissolve 0.5 g in 50 ml of acetic acid. A clear orange yellow solution should be obtained

3 **Non-volatile Matter**—Ignite 1 g gently in a silica crucible. Not more than 1 mg of residue should be left

4 **Assay**—Dissolve 0.2 g in 25 ml of water containing 1 g of potassium iodide, add 5 ml of dilute acetic acid and titrate with $N/10 \text{ Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator

1 ml $N/10 \text{ Na}_2\text{S}_2\text{O}_3 \equiv 0.005832 \text{ g ICl}_3$

Not less than 97 per cent should be indicated

ANALAR 7-iodo-8-hydroxyquinoline- 5-sulphonic acid (Ferron)

$\text{C}(\text{OH}) \text{Cl} \text{CH} \text{C}(\text{SO}_3\text{H}) \text{C} \equiv \text{N} \text{CH} \text{CH} \text{CH} = 351.13$

Maximum Limit of Impurity

Sulphated Ash

0.1 per cent

Sensitivity to Iron (Fe) 1 in 5 000 000 minimum

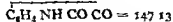
1 **Description**—A yellow crystalline powder

2 **Solubility**—Dissolve 0.2 g in 50 ml of hot water. A clear orange yellow solution should be produced

3 **Sulphated Ash**—Moisten 1 g with sulphuric acid in a silica crucible and ignite gently. Not more than 1 mg of residue should be left

4 **Sensitivity**—Add 0.2 ml of a 0.2 per cent aqueous solution to a mixture of 50 ml of water, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 0.5 ml of $N/10 \text{ HCl}$. The colour produced within 5 minutes should be definitely green when compared with a solution containing 50 ml of water, 0.5 ml of $N/10 \text{ HCl}$ and 0.2 ml of the 0.2 per cent reagent solution

ANALAR ISATIN



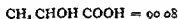
Maximum Limit of Impurity

Sulphated Ash

0.05 per cent

- 1 **Description**—Yellow red or brick red crystals or powder
- 2 **Solubility**—Slightly soluble in cold water. More soluble in hot water forming a clear orange red solution. Dissolve 1 g. in 50 ml. of 90 per cent alcohol. A clear red solution should be obtained.
- 3 **Melting Point**—200° to 203°
- 4 **Sulphated Ash**—Moisten 2 g. with sulphuric acid and ignite gently. Not more than 1 mg. of residue should be left.

ANALAR LACTIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.02	per cent
Chloride (Cl)	0.001	per cent
Sulphate (SO ₄)	0.01	per cent
Heavy Metals (Pb)	0.0004	per cent
Iron (Fe)	0.0002	per cent
Arsenic (As ₂ O ₃)	0.00002	per cent
	(0.2 part per million)	
Reducing Sugars	no reaction	

- 1 **Description**.—A clear syrupy liquid almost colourless and odourless. Twelve to 15 per cent of the acid is normally present in the form of anhydrides.
- 2 **Solubility**—Miscible in all proportions with water and with alcohol forming clear colourless solutions.
- 3 **Sulphated Ash**—To 10 g. add 2 drops of sulphuric acid and ignite gently. Not more than 2 mg. of residue should be left.
- 4 **Chloride**.—Dissolve 1 ml. in 50 ml. of water and add 1 ml. of dilute nitric acid and 1 ml. of silver nitrate solution. No opalescence should be produced.

(Continued overleaf)

LACTIC ACID—continued

5 **Sulphate**—Dissolve 1 ml in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**—Dissolve 5 g in 35 ml of water, add 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Arsenic**—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than 3.002 mg standard stain.

8 **Reducing Sugars**—Dissolve 1 ml in 10 ml of water, add 3 ml of sodium hydroxide solution and 5 ml of Fehling's solution and heat in a boiling water bath for 5 minutes. No red precipitate should be produced.

9 **Assay**—Dilute 4 g with 100 ml of water, add 50 ml of N/1 NaOH, boil gently for 5 minutes, cool and titrate with N/1 HCl using phenolphthalein as indicator.

1 ml N/1 NaOH \approx 0.09008 g $\text{CH}_3\text{CHOHCOOH}$

Not less than the equivalent of 88 per cent should be indicated.

ANALAR LACTOSE



Maximum Limits of Impurities

Alcohol soluble Impurities	0.1 per cent
Acidity	0.5 ml N/1 per cent ¹
Sulphated Ash	0.05 per cent
Formaldehyde	no reaction
Protein (N)	0.05 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Moisture	0.4 per cent

1 **Description**—A white crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Alcohol-soluble Impurities**—Shake occasionally 5 g with 20 ml of 90 per cent alcohol during 30 minutes, filter, evaporate 10 ml of the filtrate, dry at 100° and weigh the residue. From the weight obtained deduct 2.5 mg. The difference should not exceed 2.5 mg.

4 **Acidity**—Dissolve 10 g in 100 ml of hot carbon dioxide free water and titrate with N/10 NaOH using phenolphthalein as indicator. Not more than 0.5 ml of N/10 NaOH should be required.

5 **Specific Rotation**— $[\alpha]_D^{20} +5.7^{\circ}$ to $+52.6^{\circ}$ determined on a 10 per cent w/v well boiled aqueous solution

6 **Sulphated Ash**—Moisten 10 g with sulphuric acid and ignite gently, again moisten with sulphuric acid and ignite. Not more than 5 mg of residue should be left

7 **Formaldehyde**—Dissolve 1 g in 10 ml of water and add 1 ml of Schiff's reagent. No violet colour should be produced

8 **Protein**—Digest 1 g with 20 ml of sulphuric acid and 0.05 g of cupric sulphate until completely oxidised. Cool dilute with water render alkaline with sodium hydroxide distil and collect the distillate in 10 ml of N/100 H_2SO_4 and titrate the excess of acid with N/100 NaOH using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 3.6 ml

9 **Heavy Metals and Iron**—Dissolve 5 g in 45 ml of water add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be greater than the standard colours defined in appendix 2

10 **Moisture**—Dry 5 g at 100° for 1 hour. The loss in weight should not exceed 20 mg

ANALAR

LEAD

Pb = 207.21

Maximum Limits of Impurities

Silver (Ag)	0.00005 per cent
Copper (Cu)	0.001 per cent
Iron (Fe)	0.001 per cent
Total Foreign Metals (as sulphates)	0.02 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description**—A bluish grey soft metal

2 **Silver**—Dissolve 20 g in 70 ml of dilute nitric acid by the aid of gentle heat add 20 ml of water and 10 ml of sulphuric acid allow to stand for 5 minutes and filter. Evaporate the filtrate until white fumes are evolved cool add 5 ml of water and again evaporate until white fumes are evolved cool add 100 ml of water and 100 ml of alcohol allow to stand for 2 hours and filter. Remove the alcohol from the filtrate by evaporation dilute to 100 ml with water and add 1 ml of dilute hydrochloric acid. No opalescence should be produced

3 **Copper**—To 5 ml of the solution from the preceding test add 10 ml of water 10 ml of ammonium acetate solution 3 drops of pyridine

(Continued on next leaf)

LEAD—continued

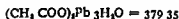
1 ml of ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not exceed that given by 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in 12 ml of water and 2 ml of dilute acetic acid with the quantities of reagents used in the test and treated in the same manner.

4 **Iron**—To 5 ml of the solution from Test No. 2 add 5 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate. Shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

5 **Total Foreign Metals**.—Evaporate to dryness 50 ml of the solution from Test No. 2 and ignite gently. Not more than 2 mg of residue should be obtained.

6 **Arsenic**—To 25 ml of the solution from Test No. 2 add 25 ml of water and 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

ANALAR LEAD ACETATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.002 per cent
Copper (Cu)	0.001 per cent
Iron (Fe)	0.001 per cent
Alkalis (Na)	0.015 per cent

1 **Description**—White or colourless crystals or crystalline masses.

2 **Solubility**—Dissolve 5 g in 50 ml of carbon dioxide free water. A colourless solution is produced which is not more than slightly opalescent and becomes clear on the addition of a few drops of acetic acid.

3 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 **Copper**—Dissolve 1 g in 15 ml of water, add 5 ml of ammonium acetate solution, 2 ml of acetic acid, 3 drops of pyridine, 1 ml of

ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not exceed that given by 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in 15 ml of water with the quantities of reagents used in the test and treated in the same manner.

6 Iron.—Dissolve 1 g in 5 ml of water, add 3 ml of dilute sulphuric acid and filter, to 4 ml of the filtrate add 5 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 Alkalis.—Dissolve 10 g in 200 ml of water, add 20 ml of dilute hydrochloric acid and filter, remove the remainder of the lead by means of hydrogen sulphide, filter, evaporate the filtrate to dryness, add 1 drop of sulphuric acid and ignite gently. Not more than 5 mg of residue should be obtained.

8 Assay.—Dissolve 0.6 g in 50 ml of water, add a few drops of acetic acid, heat nearly to boiling and precipitate the lead with 1 g of oxalic acid. Cool, filter, wash the precipitate free from soluble oxalate, suspend it in 50 ml of water, add 5 ml of dilute sulphuric acid, warm to 60° and titrate with N/10 KMnO_4 .

1 ml N/10 KMnO_4 = 0.01896 g $(\text{CH}_3\text{COO})_2\text{Pb} \cdot 3\text{H}_2\text{O}$

Not less than 99.5 per cent and not more than 103 per cent should be indicated.

ANALAR

LEAD ACETATE (BASIC)

Approximate formula $(\text{CH}_3\text{COO})_2\text{Pb} \cdot \text{Pb}(\text{OH})_2$ = 566.5

Maximum Limits of Impurities

Nitrate (NO_3)	0.002 per cent
Copper (Cu)	0.002 per cent
Iron (Fe)	0.004 per cent

1. Description.—A heavy white powder.

2. Solubility.—Slowly soluble in water forming a hazy alkaline solution.

3. Nitrate.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

4. Copper.—Dissolve 0.5 g in 15 ml of water, add 5 ml of ammonium acetate solution, 2 ml of dilute acetic acid, 3 drops of pyridine, 1 ml of ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic

(Continued overleaf)

LEAD ACETATE (BASIC)—*continued*

layer should not exceed that given by 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in 15 ml of water with the quantities of reagents used in the test and treated in the same manner

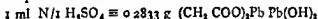
5 Iron—Dissolve 0.5 g in 5 ml of water, add 3 ml of dilute sulphuric acid and filter, to 4 ml of the filtrate add 5 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

6 Assay—(a) Dissolve 0.5 g in 50 ml of water, add 2 ml of dilute acetic acid, heat nearly to boiling and precipitate the lead with 1 g of oxalic acid. Cool, filter, wash the precipitate free from soluble oxalate, suspend it in 50 ml of water add 5 ml of dilute sulphuric acid warm to 60° and titrate with N/10 KMnO_4



Not less than 98 per cent should be indicated

(b) Dissolve 5 g in 100 ml of water, add 50 ml of N/1 H_2SO_4 and sufficient water to produce 200 ml. Shake, allow to settle decant 100 ml of the clear liquid and titrate the excess of acid with N/1 NaOH using phenolphthalein as indicator



Not less than 93 per cent should be indicated

ANALAR LEAD DIOXIDE



Maximum Limits of Impurities

Water soluble Matter	0.1 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Carbonate	passes test
Manganese (Mn)	0.0005 per cent

1 Description—A dark brown or nearly black amorphous powder

2 Water-soluble Matter—Boil 2 g with 50 ml of water, filter, evaporate the filtrate to dryness on a water-bath and weigh the residue. Not more than 2 mg should be obtained

3 Chloride—Warm 2 g with 10 ml of dilute nitric acid 30 ml of water and 6 ml of hydrogen peroxide (20 volumes) until solution is complete. Cool and add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2

4 Sulphate.—Boil 1 g with 50 ml of water and 10 ml of ammonium acetate solution, cool, filter and to the filtrate add 1 ml of dilute acetic acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Carbonate.—Moisten 5 g on a watch glass with 5 ml of water, add 5 ml of nitric acid and stir with a platinum wire. No evolution of gas should be perceptible.

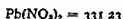
6 Manganese.—Boil 2 g with 5 ml of nitric acid and 1 ml of water, cool, add 15 ml of water and 5 ml of dilute sulphuric acid and allow the precipitate to settle. The supernatant liquid should not be coloured pink.

7 Assay.—Shake 0.5 g with 1 g of potassium iodide, 25 g of sodium chloride, 100 ml of water and 20 ml of hydrochloric acid until dissolved, and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, using starch as indicator.

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 \equiv 0.01196 \text{ g PbO}_2$$

Not less than 95 per cent should be indicated.

ANALAR LEAD NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Copper (Cu)	0.001 per cent
Iron (Fe)	0.001 per cent
Alkalis and other Metals (Na)	0.03 per cent

1 Description.—White crystals or a crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Chloride.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 Copper.—Dissolve 1 g in 15 ml of hot water, add 5 ml of ammonium acetate solution and 2 ml of dilute acetic acid, cool and add 3 drops of pyridine, 1 ml of ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not exceed that given by 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in 15 ml of water with the quantities of reagents used in the test and treated in the same manner.

5 Iron.—Dissolve 1 g in 5 ml of water, add 3 ml of dilute sulphuric acid and filter, to 4 ml of the filtrate add 5 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of

LEAD NITRATE—continued

ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

6 Alkalis and other Metals—Dissolve 5 g in 100 ml of water, add 2 g of ammonium acetate and 5 ml of dilute acetic acid and remove the lead by means of hydrogen sulphide, filter, evaporate the filtrate to dryness, add 2 drops of sulphuric acid and ignite gently. Not more than 5 mg of residue should be obtained.

ANALAR LEAD OXIDE



Maximum Limits of Impurities

Acetic Acid insoluble Matter	0.1	per cent
Chloride (Cl)	0.005	per cent
Nitrate (NO_3)	0.002	per cent
Silver (Ag)	0.00005	per cent
Copper (Cu)	0.001	per cent
Iron (Fe)	0.0025	per cent
Total Foreign Metals (as sulphates)	0.25	per cent
Loss on Ignition	0.4	per cent

1 Description—A heavy yellow or orange coloured powder.

2 Acetic Acid-insoluble Matter—Dissolve 10 g in 25 ml of hot dilute acetic acid and 25 ml of water, filter, wash the filter with water until free from acid, and dry. Not more than 10 mg of residue should be obtained.

3 Chloride—Dissolve 2 g in 5 ml of dilute nitric acid and 45 ml of water and add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 Nitrate—Dissolve 1 g in 3 ml of dilute acetic acid and 5 ml of water, add 2 ml of dilute sulphuric acid, 0.2 g of oxalic acid, boil, cool, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 Silver—Dissolve 20 g in 50 ml of hot dilute nitric acid and 40 ml of water, add 10 ml of sulphuric acid diluted with 10 ml of water, allow to stand for 5 minutes and filter. Evaporate the filtrate until white fumes are evolved, cool, add 5 ml of water and again evaporate until white fumes are evolved, cool, add 100 ml of water and 100 ml of alcohol, allow to stand for 2 hours and filter. Remove the alcohol from the filtrate.

by evaporation dilute to 100 ml with water and add 1 ml of dilute hydrochloric acid. No opalescence should be produced.

6 Copper.—To 5 ml of the solution from the preceding test add 10 ml of water, 10 ml of ammonium acetate solution, 3 drops of pyridine, 1 ml of ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not exceed that given by 1 ml of standard copper solution (1 ml = 0.01 mg Cu) in 12 ml of water and 2 ml of dilute acetic acid with the quantities of reagents used in the test and treated in the same manner.

7 Iron.—To 2 ml of the solution from Test No. 5 add 8 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

8 Total Foreign Matter.—Evaporate to dryness 50 ml of the solution from Test No. 5, ignite gently and weigh the residue. Not more than 25 mg should be obtained.

9 Loss on Ignition.—Gently ignite 5 g in a porcelain crucible. The loss in weight should not exceed 20 mg.

ANALAR LITHIUM SULPHATE



Maximum Limits of Impurities

Reaction	pH 6.5 to 7.5
Chloride (Cl)	0.002 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Loss on drying	14.0 to 15.5 per cent

1 Description.—White crystals or crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained.

3 Reaction.—Dissolve 1 g in 10 ml of carbon dioxide free water. The pH of the solution should lie between the limits of 6.5 to 7.5 using bromothymol blue as indicator.

4 Chloride.—Dissolve 5 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.

(Continued overleaf)

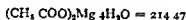
LITHIUM SULPHATE—continued

5 **Nitrate**—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Heavy Metals and Iron**—Dissolve 2 g in 45 ml of water add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

7 **Loss on Drying**—Dry 1 g at 150° to constant weight. The loss in weight should not be less than 0.140 g and not more than 0.155 g.

ANALAR MAGNESIUM ACETATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Lead (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Zinc (Zn)	0.000 per cent
Sodium (Na)	0.006 per cent

1 **Description**—Colourless crystals.

2 **Solubility**—Readily soluble in alcohol. Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate**—Dissolve 1 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Lead**—Dissolve 7 g in 25 ml of water and 5 ml of dilute acetic acid add 10 ml of dilute ammonia solution and 1 ml of potassium cyanide solution dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any brown colour produced should not be greater than that produced by the addition of 2 drops of sodium sulphide solution to 50 ml of solution containing 2 g of the sample. 5 ml of dilute acetic acid 10 ml of dilute ammonia solution 1 ml of potassium cyanide solution and 5 ml of standard lead solution (1 ml = 0.01 mg Pb).

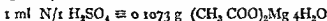
6 **Iron**—Dissolve 2 g in 7 ml of water and add 4 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate. Shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that

produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

7 **Zinc**—Dissolve 5 g in 40 ml of water and add 10 ml of dilute hydrochloric acid and 1 ml of potassium ferrocyanide solution and allow to stand for 10 minutes. No turbidity should be produced

8 **Sodium**—Dissolve 2.5 g in 3 ml of uranium acetate solution* and 7 ml of water add 10 ml of alcohol and allow to stand for 1 hour. No turbidity or precipitate should be produced

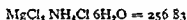
9 **Assay**—Ignite 3 g gently until completely decomposed, boil the residue with 100 ml of water and 50 ml of N/1 H_2SO_4 for 10 minutes, filter and wash with water. Titrate the filtrate and washings with N/1 NaOH using methyl red as indicator



Not less than 99 per cent should be indicated

ANALAR

MAGNESIUM AMMONIUM CHLORIDE



Maximum Limits of Impurities

Free Acid	0.1 ml N/1 per cent
Free Alkali	0.1 ml N/1 per cent
Sulphate (SO_4)	0.01 per cent
Phosphate (PO_4)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium (Ba)	0.002 per cent
Calcium (Ca)	0.005 per cent
Arsenic (As_2O_3)	0.0005 per cent
	(5 parts per million)

1 **Description**—White crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.1 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Sulphate**—Dissolve 1 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

* Dissolve 0.5 g of uranyl acetate AnalAR in 10 ml of water, heat to boiling and add 1.5 ml of dilute ammonia solution. Filter, wash the precipitate with hot water and dissolve in 3 ml of dilute acetic acid.

(Continued overleaf)

MAGNESIUM AMMONIUM CHLORIDE—*conts med*

5 **Phosphate.**—Dissolve 5 g in 50 ml of water and add 1 ml of dilute ammonia solution. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron.**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Barium.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 6 hours. No turbidity or precipitate should be produced.

8 **Calcium.**—Dissolve 1 g in 20 ml of water and add 1 ml of ammonium oxalate solution. No turbidity or precipitate should be produced.

9 **Arsenic.**—Dissolve 2 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than 2.0 or 1 mg standard stain.

10 **Assay.**—(a) Dissolve 0.4 g in 50 ml of water, add 5 ml of nitric acid and 50 ml of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator.

$$1 \text{ ml N/10 AgNO}_3 \equiv 0.008561 \text{ g MgCl}_2 \cdot \text{NH}_4\text{Cl} \cdot 6\text{H}_2\text{O}$$

Not less than 96 per cent should be indicated.

(b) Dissolve 1 g in 150 ml of water, add 1 ml of dilute hydrochloric acid, 5 g of ammonium acetate and 10 ml of ammonium phosphate solution. Heat to boiling, add a few drops of phenolphthalein solution, render slightly alkaline with dilute ammonia solution and stir until a precipitate separates. Cool, add 25 ml of dilute ammonia solution and allow to stand overnight. Filter off the precipitate in a Gooch crucible, wash with diluted ammonia until free from chloride, add a crystal of ammonium nitrate, dry, ignite and weigh the resulting $\text{Mg}_3\text{P}_2\text{O}_7$.

$$\text{Weight of Mg}_3\text{P}_2\text{O}_7 \times 2.3075 = \text{weight of MgCl}_2 \cdot \text{NH}_4\text{Cl} \cdot 6\text{H}_2\text{O}$$

Not less than 96 per cent should be indicated.

ANALAR

MAGNESIUM CHLORIDE



Maximum Limits of Impurities

Alcohol insoluble Matter	nil
Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Sulphate (SO_4)	0.005 per cent
Phosphate (PO_4)	0.0005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium (Ba)	0.01 per cent
Calcium (Ca)	0.005 per cent
Arsenic (As_2O_3)	0.0005 per cent
	(5 parts per million)

1 **Description**—Colourless deliquescent crystals

2 **Solubility**—Completely soluble in 6 times its weight of 90 per cent alcohol. Dissolve 5 g in 50 ml of water a clear colourless solution should be produced

3 **Reaction**—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so

4 **Sulphate**—Dissolve 2 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Phosphate**—Dissolve 2 g in 20 ml of water add 3 ml of dilute sulphuric acid 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any colour produced should not be deeper than the standard colour defined in appendix 2

6 **Heavy Metals and Iron**—Dissolve 2 g in 40 ml of water add 5 ml of ammonium chloride solution and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2

7 **Barium**—Dissolve 2 g in 50 ml of water add 1 ml of dilute sulphuric acid and allow to stand for 6 hours. No turbidity or precipitate should be produced

8 **Calcium**—Dissolve 2 g in 50 ml of water add 5 ml of ammonium chloride solution 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

(Continued overleaf)

MAGNESIUM CHLORIDE—continued

9 Arsenic—Dissolve 2 g in 50 ml of water add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

10 Assay—Dissolve 0.4 g in 50 ml of water add 10 ml of dilute nitric acid and 50 ml of N/10 AgNO_3 filter wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator.

1 ml N/10 $\text{AgNO}_3 \equiv 0.01016 \text{ g MgCl}_2 \cdot 6\text{H}_2\text{O}$

Not less than 98 per cent should be indicated

ANALAR MAGNESIUM OXIDE

$\text{MgO} = 40.32$

Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.01 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)
Loss on Ignition	5.0 per cent

1 Description—A white powder

2 Solubility—Almost insoluble in water. Dissolve 2 g in 20 ml of dilute hydrochloric acid and 30 ml of water a clear solution should be produced.

3 Chloride—Dissolve 1 g in 15 ml of dilute nitric acid cool add 35 ml of water and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

4 Sulphate—Dissolve 1 g in 15 ml of dilute hydrochloric acid, add 35 ml of water and 5 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Nitrate—Dissolve 0.4 g in 12 ml of dilute sulphuric acid, add 1 ml of standard indigo solution and 12 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Heavy Metals—Dissolve 0.25 g in 5 ml of dilute acetic acid and 45 ml of water and pass hydrogen sulphide through the solution for a few seconds. No darkening in colour should be observed.

7 Iron—Dissolve 0.1 g in 2 ml of dilute hydrochloric acid and 8 ml of water and add 1 drop of N/10 KMnO_4 mix add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes

of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

8 Arsenic.—Dissolve 5 g in 35 ml of brominated hydrochloric acid and 35 ml of water, add a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

9 Loss on Ignition.—Heat 1 g to dull redness. The loss in weight should not exceed 50 mg.

ANALAR MAGNESIUM SULPHATE



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Chloride (Cl)	0.0002 per cent
Phosphate (PO_4)	0.0005 per cent
Heavy Metals (Pb)	0.0005 per cent
Iron (Fe)	0.0001 per cent
Zinc (Zn)	0.0005 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 Description.—Colourless free running crystals.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Reaction.—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 Chloride.—Dissolve 5 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 Phosphate.—Dissolve 2 g in 20 ml of water add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the standard colour defined in appendix 2.

6 Lead.—Dissolve 12 g in 30 ml of water add 5 ml of dilute acetic acid, 8 ml of dilute ammonia solution and 1 ml of potassium

(Continued overleaf)

MAGNESIUM SULPHATE—continued

cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be deeper than that given by the addition of 2 drops of sodium sulphide solution to 50 ml of a solution containing 2 g of the sample, 5 ml of dilute acetic acid 8 ml of dilute ammonia solution 1 ml of potassium cyanide solution and 5 ml of standard lead solution (1 ml = 0.01 mg Pb)

7 **Iron**.—Dissolve 5 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 max, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

8 **Zinc**.—Dissolve 5 g in 50 ml of water and add 1 ml of dilute hydrochloric acid and 1 ml of potassium ferrocyanide solution. No opalescence should be produced

9 **Arsenic**.—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

ANALAR MANGANESE CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.001 per cent
Nickel (Ni)	0.001 per cent
Zinc (Zn)	0.05 per cent
Barium (Ba)	0.02 per cent
Calcium (Ca)	0.02 per cent
Magnesium and Alkalis (as sulphates)	0.1 per cent
Oxidising and Reducing Substances	passes test

1 **Description**.—Pink crystals

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear faintly pink solution should be produced

3 **Reaction**.—A solution of 1 g in 25 ml of water should not be acid to bromocresol green

4 **Sulphate**.—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 Heavy Metals and Zinc—Dissolve 1 g in 50 ml of water, add 1 ml of dilute acetic acid and 1 g of sodium acetate and pass hydrogen sulphide through the solution for a few seconds. No colour, turbidity or precipitate should be produced.

6 Iron—Dissolve 1 g in 10 ml of water, add 1 ml. of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 Nickel—Dissolve 1 g in 25 ml of water, heat to boiling and add 1 ml of niroxime solution. No deepening of the pink colour should occur.

8 Barium—Dissolve 1 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 2 hours. No turbidity or precipitate should be produced.

9 Calcium—Dissolve 1 g in 30 ml of water, add 10 ml of ammonium chloride solution and 10 ml of dilute ammonia solution. Heat to boiling and completely precipitate the manganese by passing hydrogen sulphide through the solution. Filter, cool the filtrate and add 4 ml of ammonium oxalate solution. No turbidity should be produced.

10 Magnesium and Alkalis—Dissolve 2 g in 50 ml of hot water, add 20 ml of freshly prepared ammonium carbonate solution and warm until the precipitate becomes granular, filter, evaporate the filtrate to dryness, add 2 drops of sulphuric acid and ignite gently. Not more than 2 mg of residue should be obtained.

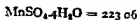
11 Oxidising and Reducing Substances—Dissolve 10 g in 100 ml of freshly boiled and cooled water and add 1 g of potassium iodide, 1 ml of starch solution and 5 ml of dilute hydrochloric acid. No blue colour should be produced. On the further addition of 0.05 ml of N/10 I a blue colour should appear.

12 Assay—To 0.1 g add 3 ml of sulphuric acid and evaporate to dryness. Repeat the procedure with 2 ml of sulphuric acid, add a further 1 ml and evaporate to fumes. Dissolve the residue in a cooled mixture of 100 ml of water and 20 ml of nitric acid, add 1 g of sodium bismuthate and shake for 1 minute. Dilute with 100 ml of water, filter through an asbestos Gooch crucible and wash with nitric acid diluted with 33 volumes of water. To the filtrate and washings add 50 ml of N/10 $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$ and back titrate with N/10 KMnO_4 .

1 ml N/10 $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \equiv 0.003958 \text{ g MnCl}_2 \cdot 4\text{H}_2\text{O}$

Not less than 95 per cent and not more than 101 per cent should be indicated.

ANALAR MANGANESE SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.001 per cent
Nickel (Ni)	0.001 per cent
Zinc (Zn)	0.05 per cent
Calcium (Ca)	0.02 per cent
Magnesium and Alkalis (as sulphates)	0.1 per cent
Oxygen absorbed from KMnO_4 (O)	0.0008 per cent
Oxidising and Reducing Substances	passes test

1 **Description**—Pink transparent crystals or an almost white powder

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear faintly pink solution should be produced.

3 **Reaction**.—A solution of 1 g in 25 ml of water should not be acid to bromocresol green.

4 **Chloride**.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Heavy Metals and Zinc**.—Dissolve 1 g in 50 ml of water, add 1 ml of acetic acid and 1 g of sodium acetate, and pass hydrogen sulphide through the solution for a few seconds. No colour, turbidity, or precipitate should be produced.

6 **Iron**.—Dissolve 1 g in 10 ml of water, add 1 ml of dilute hydrochloric acid and 1 drop of $\text{N}/10$ KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

7 **Nickel**.—Dissolve 1 g in 25 ml of water heat to boiling and add 1 ml of niroxime solution. No deepening of the pink colour should occur.

8 **Calcium**.—Dissolve 1 g in 30 ml of water, add 10 ml of ammonium chloride solution and 10 ml of dilute ammonia solution. Heat to boiling and completely precipitate the manganese by passing hydrogen sulphide through the solution. Filter, cool the filtrate and add 4 ml of ammonium oxalate solution. No turbidity should be produced.

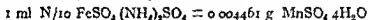
9 **Magnesium and Alkalis**.—Dissolve 2 g in 50 ml of hot water, add 20 ml of freshly prepared ammonium carbonate solution and

warm until the precipitate becomes granular, filter, evaporate the filtrate to dryness and ignite gently. Not more than 2 mg of residue should be left.

10 Oxygen Absorption—Dissolve 10 g in 100 ml of water and add 2 ml of dilute sulphuric acid 1 ml of phosphoric acid and 0.1 ml of N/10 KMnO_4 . A pink colour should be produced.

11 Oxidising and Reducing Substances—Dissolve 10 g in 100 ml of freshly boiled and cooled water and add 1 g of potassium iodide 1 ml of starch solution and 5 ml of dilute hydrochloric acid. No blue colour should be produced. On the further addition of 0.05 ml of N/10 I a blue colour should appear.

12 Assay—Dissolve 0.15 g in a cooled mixture of 100 ml of water and 20 ml of nitric acid add 1.5 g of sodium bismuthate and shake for 1 minute. Dilute with 100 ml of water filter through an asbestos Gooch crucible and wash with nitric acid diluted with 33 volumes of water. To the filtrate and washings add 50 ml of N/10 $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$ and back titrate with N/10 KMnO_4 .



Not less than 97 per cent. and not more than 101 per cent should be indicated.

ANALAR MERCURIC CHLORIDE



Maximum Limits of Impurities

Water insoluble Matter	nil
Alcohol insoluble Matter	nil
Ether insoluble Matter	nil
Non volatile Matter	0.05 per cent
Nitrate (NO_3)	0.0005 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 Description—Heavy colourless crystals

2 Water-insoluble Matter—Dissolve 5 g in 100 ml of water. A clear colourless solution should be obtained.

3 Alcohol insoluble Matter—Dissolve 1 g in 20 ml of 90 per cent alcohol. A clear colourless solution should be obtained.

4 Ether-insoluble Matter—Dissolve 1 g finely powdered in 30 ml of ether. A clear colourless solution should be obtained.

5 Non-volatile Matter—Moisten 2 g with sulphuric acid and ignite gently in a fume cupboard. Not more than 1 mg of residue should be left.

(Continued overleaf)

MERCURIC CHLORIDE—continued

6 Nitrate—Dissolve 0.1 g in 1 ml of water and add 4 ml. of diphenylbenzidine reagent. Any blue colour produced should not be greater than that produced by adding 4 ml of the reagent to 1 ml of water.

7 Arsenic—Mix intimately 5 g with 2.5 g of anhydrous sodium carbonate, moisten the mixture with 5 ml of water dry carefully and ignite strongly in a fume cupboard. Dissolve the residue in 50 ml of water add 10 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

8 Assay—Dissolve 0.5 g in 100 ml of water in a stoppered flask add 15 ml of calcium chloride solution 10 ml of potassium iodide solution 5 ml of formaldehyde solution and 20 ml of sodium hydroxide solution and shake continuously for 2 minutes. Add 25 ml of dilute acetic acid and 50 ml of N/10 I shake until the precipitated mercury is completely redissolved allow to stand for 10 minutes and titrate the excess of iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$.

1 ml N/10 I = 0.01358 g HgCl_2

Not less than 99.5 per cent should be indicated

ANALAR MERCUROUS CHLORIDE

$\text{HgCl} = 236.07$

Maximum Limits of Impurities

Non volatile Matter	0.02 per cent
Sulphate (SO_4)	0.01 per cent
Mercuric Salt (Hg)	0.0005 per cent.

1 Description.—A dense white powder

2 Solubility.—Insoluble in water and in alcohol

3 Non-volatile Matter.—Moisten 5 g with sulphuric acid and ignite gently in a fume cupboard. Not more than 1 mg of residue should be left

4 Sulphate.—Shake 1 g with 50 ml of cold water for 5 minutes and filter, to the filtrate add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 Mercuric Salt.—Shake 2 g with 50 ml of cold water for 5 minutes and filter, to the filtrate add 1 drop of sodium sulphide solution. No darkening in colour should be produced

6 Assay.—To 0.7 g in a stoppered flask add 20 ml of water 50 ml of N/10 I and 5 g of potassium iodide allow to stand with occasional

shaking until complete solution is obtained and titrate the excess of iodine with $N/10 \text{ Na}_2\text{S}_2\text{O}_3$

1 ml $N/10 = 0.02361 \text{ g HgCl}$

Not less than 99.6 per cent should be indicated

ANALAR MERCUROUS NITRATE

$\text{HgNO}_3 \cdot \text{H}_2\text{O} = 280.63$

Maximum Limits of Impurities

Acid insoluble Matter	nil
Non volatile Matter	0.05 per cent
Sulphate (SO_4)	0.01 per cent

1 **Description**—Colourless or white crystals

2 **Solubility**—Dissolve 5 g in 10 ml of water and 2 ml of dilute nitric acid. A clear solution should be formed

3 **Non-volatile Matter**—Moisten 2 g with sulphuric acid and ignite gently in a fume cupboard. Not more than 1 mg of residue should be left

4 **Sulphate**.—Dissolve 2 g in 10 ml of dilute nitric acid and 40 ml of water. Add 1 ml of barium nitrate solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Assay**.—Treat 1 g with 5 ml of dilute acetic acid. 1 g of sodium acetate, 50 ml of $N/10 \text{ I}$ and 2 g of potassium iodide. Shake vigorously in a stoppered bottle until solution is complete and titrate the excess of iodine with $N/10 \text{ Na}_2\text{S}_2\text{O}_3$

1 ml $N/10 \text{ I} = 0.02806 \text{ g HgNO}_3 \cdot \text{H}_2\text{O}$

Not less than 95 per cent should be indicated

ANALAR MERCURY

$\text{Hg} = 200.61$

Maximum Limits of Impurities

Acid insoluble Matter	nil
Non volatile Matter	0.002 per cent
Other Metals	no reaction

1 **Description**—A silver white liquid metal with a bright surface

2 **Solubility**.—Warm 10 g with 30 ml of nitric acid diluted with 30 ml of water. Complete solution should result

(Continued overleaf)

MERCURY—continued

3 **Non-volatile Matter**—Evaporate 50 g on a sand bath in a fume cupboard. Not more than 1 mg of residue should be left.

4 **Other Metals**—Heat 5 g with a clear solution of 5 g of sodium thiosulphate in 5 ml of water in a boiling water bath for 1 minute. The surface of the mercury should remain bright.

ANALAR METHYL ALCOHOL



Maximum Limits of Impurities

Acidity	0.05 ml N/1	per cent
Alkalinity	0.05 ml N/1	per cent
Non volatile Matter	0.002	per cent
Aldehydes and Ketones $((\text{CH}_3)_2\text{CO})$	0.06	per cent
Organic Impurities	passes test	
Oxygen absorbed (O)	0.0004	per cent
Water	0.2	per cent

1 **Description**.—A clear colourless liquid with a characteristic odour.

2 **Solubility**.—Miscible in all proportions with water forming clear colourless solutions.

3 **Reaction**.—Mix 10 ml with 10 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Specific Gravity** ($15.5^\circ/15.5^\circ$)—0.796 to 0.798.

5 **Refractive Index**— n_D^{20} 1.328 to 1.331.

6 **Boiling Range**.—Not less than 95 per cent should distil between 64.5° and 65.5° .

7 **Non volatile Matter**.—Evaporate 30 ml to dryness on a water bath. Not more than 0.5 mg of residue should be left.

8 **Aldehydes and Ketones**.—Mix in a stoppered cylinder 25 ml with 25 ml of water and 50 ml of hydroxylamine hydrochloride reagent allow to stand for 5 minutes and titrate with N/10 NaOH to the same green colour as shown by 50 ml of the reagent contained in a similar cylinder both being viewed down the axes of the cylinders. Not more than 2.0 ml of N/10 NaOH should be required.

9 **Organic Impurities**.—(a) Mix 10 ml with 10 ml of sodium hydroxide solution. No colour should be produced.

(b) Mix 5 ml with 5 ml of sulphuric acid keeping the mixture cool. Not more than a faint yellow colour should be produced.

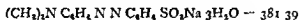
10 **Oxygen Absorbed**.—To 10 ml add 0.05 ml of N/10 KMnO_4 . The pink colour should persist for 10 minutes.

11 Water—Titrate 40 g slowly with Karl Fischer reagent until a small excess is present and a permanent iodine colour is established. Back titrate this excess electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used should be equivalent to not more than 80 mg of water.

ANALAR

METHYL ORANGE

(pH range 2.8 to 4.6)



Maximum Limits of Impurities

Insoluble Matter	nil
Chloride (Cl)	0.002 per cent
Sulphate (SO ₄)	0.02 per cent
Loss on Drying	15.0 per cent

- 1 Description**—Golden orange crystalline scales or powder
- 2 Solubility**—Dissolve 0.1 g in 50 ml of hot water. A clear deep orange solution should be produced.
- 3 Chloride**—Dissolve 1 g in 20 ml of boiling water, add 1 ml of dilute nitric acid, cool and filter. To 10 ml of the filtrate add 40 ml of water and 1 ml of silver nitrate solution. No opalescence should be produced.
- 4 Sulphate**—Dissolve 1 g in 20 ml of boiling water, add 1 ml of dilute hydrochloric acid, cool and filter. To 10 ml of the filtrate add 40 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.
- 5 Sensitivity**—To 50 ml of water add 0.05 ml of N/10 NaOH and 0.1 ml of the aqueous solution from Test No. 2. A clear yellow solution should be produced which should change to pink on the addition of 0.5 ml of N/10 HCl.
- 6 Loss on Drying**—Dry 1 g at 100° for 1 hour. The loss in weight should not exceed 150 mg.
- 7 Assay**—Dissolve the dried material from Test No. 6 in water and dilute to 250 ml. To 50 ml add 100 ml of water and 15 g of sodium hydrogen tartrate. Boil and titrate the hot solution slowly with shaking with N/10 TiCl₃ in an inert atmosphere until completely decolorised. Run a blank determination using 10 ml of the sample solution, 140 ml of water and 15 g of sodium hydrogen tartrate.



Not less than 95 per cent should be indicated.

ANALAR

METHYL RED

(pH range 4.2 to 6.3)



Maximum Limits of Impurities

Alcohol insoluble Matter	nil
Sulphated Ash	0.5 per cent
Moisture	1.0 per cent

1 **Description**—A dark red or violet crystalline powder

2 **Solubility**—Almost insoluble in water. Dissolve 0.1 g in 50 ml of hot 90 per cent alcohol, a clear red solution should be obtained

3 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 5 mg of residue should be left

4 **Sensitivity**—To 50 ml of water add 0.05 ml of N/10 NaOH and 0.1 ml of the solution from Test No. 2. A clear yellow solution should be produced which should change to red on addition of 0.1 ml of N/10 HCl

5 **Moisture**—Dry 1 g at 100° for 1 hour. The loss in weight should not exceed 10 mg

6 **Assay**—Dissolve the dried material from Test No. 5 in 100 ml of water and 3 ml of sodium hydroxide solution and dilute with water to 250 ml. To 50 ml add 50 ml of alcohol, 1 ml of dilute hydrochloric acid and 10 g of sodium potassium tartrate dissolved in 50 ml of water. Boil and titrate the hot solution slowly with shaking with N/10 TiCl_3 in an inert atmosphere until completely decolorised. Run a blank determination using 10 ml of the sample solution, 50 ml of alcohol, 4 drops of dilute hydrochloric acid and 10 g of sodium potassium tartrate dissolved in 90 ml of water



Not less than 95 per cent should be indicated

ANALAR MOLYBDENUM TRIOXIDE

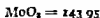


Maximum Limits of Impurities

Lower Oxides	0.05 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.001 per cent
Heavy Metals and Iron	0.002 per cent
Ammonia	no reaction

- 1 **Description**—A slightly yellow or greenish yellow powder
- 2 **Lower Oxides**—Dissolve 5 g in 20 ml of dilute ammonia solution, filter, wash with dilute ammonia solution dry any insoluble matter at 110° and weigh. Not more than 2.5 mg should be obtained
- 3-4 **Tests for Chloride and Sulphate** are carried out as described for Molybdic Acid, filtering the solutions if necessary
- 5 **Nitrate**—Mix 1 g with 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear
- 6-7 **Tests for Phosphate and Heavy Metals and Iron** are carried out as described for Molybdic Acid
- 8 **Ammonia**—Boil 1 g with 5 ml of sodium hydroxide solution. No odour of ammonia should be perceptible
- 9 **Assay**—Carry out the assay as described for Molybdic Acid. Not less than 99 per cent MoO_3 should be indicated

ANALAR MOLYBDIC ACID



Maximum Limits of Impurities

Lower Oxides	0.01 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Phosphate (PO_4)	0.001 per cent
Heavy Metals and Iron	0.002 per cent

(Continued overleaf)

MOLYBDIC ACID—continued

1 **Description**—A white or pale cream coloured powder, containing acid ammonium salt

2 **Lower Oxides**—Dissolve 5 g in 15 ml of dilute ammonia solution, filter, wash the filter with dilute ammonia solution, dry any insoluble matter at 110° and weigh. Not more than 0.5 mg should be obtained

3 **Chloride**—Dissolve 1 g in 25 ml of dilute ammonia solution and 45 ml of water and add 1 g of citric acid, when dissolved add 0.1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than that given by 0.5 ml of standard chloride solution (1 ml = 0.1 mg Cl) in an equal volume of solution containing the quantities of reagents used in the test

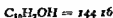
4 **Sulphate**.—Dissolve 2 g in 5 ml of dilute ammonia solution and 45 ml of water and add 2 g of citric acid when dissolved add 0.1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Phosphate**—Pour the solution from Test No. 2 into 75 ml of dilute nitric acid and allow to stand at about 40° for 2 hours. No yellow precipitate should be produced

6 **Heavy Metals and Iron**—Dissolve 0.5 g in 5 ml of dilute ammonia solution and 45 ml of water and add 1 drop of sodium sulphide solution. Any darkening in colour should not be deeper than the 'standard colours' defined in appendix 2

7 **Assay**—Dissolve 0.1 g in 60 ml of water and 10 ml of dilute ammonia solution and then add 30 ml of dilute sulphuric acid and proceed as described for Ammonium Molybdate using this solution in part (b) part (a) being carried out as described

Not less than 85 per cent MoO_3 should be indicated

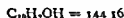
ANALAR **α -NAPHTHOL****Maximum Limits of Impurities**

Alcohol insoluble Matter	nil
Sulphated Ash	0.05 per cent
Naphthalene	no reaction
Organic Acids	no reaction

1 **Description**—Colourless or slightly pink crystals or crystalline powder with a characteristic odour

2. **Solubility.**—Slightly soluble in water. Two grams should dissolve in 10 ml. of ethyl alcohol forming a clear and almost colourless solution.
3. **Melting Point.**—95° to 97°.
4. **Sulphated Ash.**—Moisten 2 g. with sulphuric acid and ignite gently. Not more than 1 mg. of residue should be left.
5. **Naphthalene.**—Dissolve 1 g. in 3 ml. of alcohol and add 50 ml. of dilute ammonia solution. The solution should not be more than faintly opalescent and should not possess more than a slight tint.
6. **Organic Acids.**—Boil 1 g. with 50 ml. of water, cool and filter. The filtrate should be neutral to litmus paper

ANALAR β-NAPHTHOL



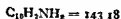
Maximum Limits of Impurities

Alcohol-insoluble Matter	nil
Sulphated Ash	0.02 per cent
Naphthalene	no reaction
α-Naphthol	0.1 per cent

1. **Description.**—Colourless or slightly pink crystals or crystalline powder with a characteristic odour.
2. **Solubility.**—Slightly soluble in water. Two grams should dissolve in 10 ml. of ethyl alcohol forming a clear and almost colourless solution.
3. **Melting Point.**—122° to 123°.
4. **Sulphated Ash.**—Moisten 5 g. with sulphuric acid and ignite gently. Not more than 1 mg. of residue should be left.
5. **Naphthalene.**—Dissolve 1 g. in 3 ml. of alcohol and add 50 ml. of dilute ammonia solution. The solution should not be more than slightly opalescent and should not possess more than a slight tint.
6. **α-Naphthol.**—Boil 1 g. with 20 ml. of water, cool and filter. To the filtrate add 2 ml. of freshly prepared sodium hypobromite solution.* A clear yellow solution, free from any brown, red or violet coloration, should be obtained.

* Dissolve 2.5 g. of sodium hydroxide in 25 ml. of water and add 1 ml. of bromine.

ANALAR α -NAPHTHYLAMINE



Maximum Limits of Impurities

Acid insoluble Matter	nil
Sulphated Ash	0.02 per cent

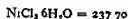
1 **Description.**—Colourless or slightly coloured crystals or crystalline powder with a characteristic odour

2 **Solubility.**—Dissolve 1 g in 30 ml of warm dilute acetic acid. The solution should be clear and not more than slightly coloured

3 **Melting Point.**—49° to 51°

4 **Sulphated Ash.**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

ANALAR NICKEL CHLORIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.004 per cent
Cobalt (Co)	0.0005 per cent
Iron (Fe)	0.001 per cent
Zinc (Zn)	0.0025 per cent
Barium (Ba)	0.02 per cent
Alkalis and other Metals (Na)	0.03 per cent

1 **Description.**—Apple green crystals or crystalline powder

2 **Solubility.**—Readily soluble in alcohol. Dissolve 5 g in 50 ml of water, a clear green solution should be produced

3 **Sulphate.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

4 **Heavy Metals.**—Dissolve 1 g in 50 ml of water, add 0.1 ml of dilute hydrochloric acid and pass hydrogen sulphide through the solution for a few seconds. Not more than a very faint darkening should be produced

5 **Cobalt.**—Dissolve 5 g in 10 ml of water, add 1 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix, add 5 ml of

ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Reject the lower layer and thoroughly shake the upper layer with 5 ml of ammonium phosphate solution and 5 ml of ammonium thiocyanate solution, allow to separate and draw off the lower layer into a second separator. Wash the liquid in the first separator with a mixture of 1 ml of ammonium phosphate solution, 2 ml of ammonium thiocyanate solution and 1 ml of water and draw off the lower layer into the second separator. Any blue colour in the upper layer should not be deeper than that produced by treating 2.5 ml of standard cobalt solution ($1 \text{ ml} = 0.01 \text{ mg Co}$) in the same manner.

6 Iron—To the aqueous liquid in the second separator from Test No. 5 add 1 ml of hydrochloric acid and 10 ml of the mixture of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour in the upper layer should not be greater than that produced by treating 5 ml of standard iron solution ($1 \text{ ml} = 0.01 \text{ mg Fe}$) with hydrochloric acid, ammonium thiocyanate, and the mixture of amyl alcohol and amyl acetate in the same manner.

7 Zinc—Dissolve 1 g in 50 ml of water and to 2.5 ml of this solution add 7.5 ml of water, 1 drop of ammonium thiocyanate solution, 1 drop of dilute sulphuric acid and 0.4 ml of a 0.05 per cent alcoholic solution of *p*-dimethylamino styryl- β naphthiazole methyl iodide. The solution should show no pink or orange colour when compared with a solution containing 10 ml of water and the reagents used in the test.

8 Barium—Dissolve 1 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

9 Alkalis and other Metals—Evaporate the solution from Test No. 10 to dryness, ignite gently and weigh the residue. Not more than 2 mg should be obtained.

10 Assay—Dissolve 2 g in 55 ml of water and add 20 ml of dilute sulphuric acid followed by 75 ml of strong ammonia solution. Warm to 70° and electrolyse the solution for 90 minutes with a current of 1.5 to 2.0 amperes using a weighed copper-plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.

$\text{Weight of Ni} \times 4.050 = \text{weight of NiCl}_2 \cdot 6\text{H}_2\text{O}$

Not less than 98 per cent should be indicated.

ANALAR NICKEL NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.01 per cent
Cobalt (Co)	0.0005 per cent
Iron (Fe)	0.001 per cent
Zinc (Zn)	0.0025 per cent
Alkalis and other Metals (Na)	0.03 per cent

1. **Description.**—Green crystals or crystalline powder

2. **Solubility.**—Dissolve 5 g in 50 ml of water. A clear green solution should be produced.

3. **Chloride.**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4. **Sulphate.**—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 5 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5-7. **Tests for Cobalt, Iron and Zinc** are carried out as described for Nickel Chloride.

8. **Alkalis and other Metals.**—Evaporate the solution from Test No. 9 to dryness, ignite gently and weigh the residue. Not more than 2 mg should be obtained.

9. **Assay.**—Dissolve 2 g in 10 ml of water, add 10 ml of sulphuric acid and evaporate nearly to dryness. Cool, dissolve the residue in 75 ml of water and add 75 ml of strong ammonia solution. Warm to 70° and electrolyse the solution for 90 minutes with a current of 1.5 to 2.0 amperes using a weighed copper-plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.

$$\text{Weight of Ni} \times 4.955 = \text{weight of Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$$

Not less than 98 per cent should be indicated.

ANALAR

NICKEL SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.003 per cent
Heavy Metals (Pb)	0.004 per cent
Cobalt (Co)	0.0005 per cent
Iron (Fe)	0.001 per cent
Zinc (Zn)	0.0025 per cent
Alkalis and other Metals (Na)	0.03 per cent
Ammonia	no reaction

1 **Description.**—Emerald green crystals or crystalline powder

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear green solution should be produced

3 **Chloride.**—Dissolve 3 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" described in appendix 2

4-7 **Tests for Heavy Metals, Cobalt, Iron and Zinc** are carried out as described for Nickel Chloride

8 **Alkalis and other Metals.**—Evaporate the solution from Test No. 10 to dryness, ignite gently and weigh the residue. Not more than 2 mg should be obtained

9 **Ammonia.**—Dissolve 1 g in 3 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible

10 **Assay.**—Dissolve 2 g in 75 ml of water, add 75 ml of strong ammonia solution, warm to 70° and electrolyse the solution for 90 minutes with a current of 1.5 to 2.0 amperes using a weighed copper-plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh

$$\text{Weight of Ni} \times 4.786 = \text{weight of NiSO}_4 \cdot 7\text{H}_2\text{O}$$

Not less than 98 per cent and not more than 108 per cent should be indicated

ANALAR

NITRIC ACID

(sp. gr. 1.42)



Maximum Limits of Impurities

Non volatile Matter	0.001	per cent
Chloride (Cl)	0.0001	per cent
Iodate (IO_3)	0.0005	per cent
Sulphate (SO_4)	0.0003	per cent
Heavy Metals (Pb)	0.0002	per cent
Iron (Fe)	0.0001	per cent
Arsenic (As_2O_3)	0.000005	per cent
	(0.05 part per million)	

1 **Description**—A clear colourless fuming liquid

2 **Non-volatile Matter**.—Evaporate 70 ml to dryness and ignite gently. Not more than 1 mg of residue should be left

3 **Chloride**.—Dilute 10 ml with 40 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced

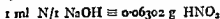
4 **Iodate**.—Dilute 20 ml with 20 ml of water, add a small granule of zinc and 3 ml of chloroform and shake. The chloroform should not be coloured violet

5 **Sulphate**.—To 50 ml add 0.2 ml of N/1 Na_2CO_3 and evaporate to dryness on a water bath. Dissolve the residue in 10 ml of water and 1 ml of N/1 HCl. Filter if necessary, and add 1 ml of barium chloride solution. Any turbidity produced should not be greater than the "standard turbidity" defined in appendix 2

6 **Heavy Metals and Iron**.—To 7 ml add 10 ml of water and 35 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

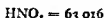
7 **Arsenic**.—To 70 ml add 5 ml of sulphuric acid and evaporate until fumes of sulphuric acid are evolved, cool, add 5 ml of water and again evaporate to fuming, cool, dilute with 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

8 **Assay**.—Dilute 3 g with 50 ml of water and titrate with N/1 NaOH using methyl red as indicator



About 70 per cent should be indicated

ANALAR
NITRIC ACID (FUMING)
 (sp. gr. 1.5)



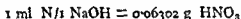
Maximum Limits of Impurities

Non volatile Matter	0.001	per cent
Chloride (Cl)	0.0001	per cent
Iodate (IO_3)	0.0005	per cent
Sulphate (SO_4)	0.0003	per cent
Heavy Metals (Pb)	0.0002	per cent.
Iron (Fe)	0.0001	per cent
Arsenic (As_2O_3)	0.000005	per cent
	(0.05 part per million)	

1 **Description**—A clear yellow fuming liquid

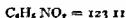
2-7 **Other Tests**—The acid should conform to Tests Nos 2 to 7 described under Nitric Acid (sp. gr. 1.42)

8 **Assay**—Dilute 2 g. with 50 ml. of water and titrate with N/1 NaOH using methyl red as indicator



Not less than 95 per cent should be indicated

ANALAR
NITROBENZENE



Maximum Limit of Impurity

Acidity	0.05 ml N/1 per cent
---------	----------------------

1 **Description**—A pale yellow liquid with a characteristic odour

2 **Weight per ml at 20°**—1.200 to 1.203 g

3 **Refractive Index**— n_D^{20} 1.5515 to 1.5530

4 **Freezing Point**—Not below 5.0°

5 **Boiling Range**—Not less than 95 per cent should distil between 210° and 212°

6 **Acidity**—Shake 16 ml with 50 ml of water for 1 minute and allow to separate. The aqueous layer should not require more than 0.1 ml of N/10 NaOH to neutralise any acidity bromophenol blue being used as indicator

ANALAR

p-NITROBENZOYL CHLORIDE



Maximum Limits of Impurities

Sulphated Ash	0.1 per cent
Phosphorus Compounds (P)	0.0025 per cent
Sulphur Compounds (S)	0.003 per cent

- 1 **Description** — Yellow crystals
- 2 **Solubility** — Decomposed by water and by alcohol
- 3 **Melting Point** — 71° to 74°
- 4 **Sulphated Ash** — Moisten 1 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left
- 5 **Phosphorus Compounds** — Boil 1 g with 1 ml of water and 2 ml of nitric acid for 1 minute add 20 ml of water cool and filter then add 10 ml of ammonium nitromolybdate solution and maintain at about 40° for 2 hours. No yellow precipitate should be produced
- 6 **Sulphur Compounds** — Boil 1 g with 1 ml of water and 2 ml of nitric acid for 1 minute add 25 ml of water cool and filter then add 20 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced
- 7 **Assay** — Dissolve 0.4 g in 20 ml of pyridine add very slowly 20 ml of water and titrate with N/10 NaOH using phenolphthalein as indicator

$$1 \text{ ml N/10 NaOH} = 0.00928 \text{ g NO}_2 \text{ C}_6\text{H}_4 \text{ COCl}$$

Not less than 98 per cent should be indicated

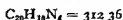
To the neutralised liquid add 20 ml of nitric acid and 25 ml of N/10 AgNO_3 . Filter wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator

$$1 \text{ ml N/10 AgNO}_3 = 0.01856 \text{ g NO}_2 \text{ C}_6\text{H}_4 \text{ COCl}$$

Not less than 98 per cent should be indicated

ANALAR NITRON

(1:4-Diphenyl-3:5-endanilo-4:5-dihydro-1:2:4-triazole)



Maximum Limit of Impurity

Sulphated Ash 0.2 per cent

Sensitivity to Nitrate (NO_3) 1 : 17 000 minimum

1 **Description**—A yellow crystalline powder

2 **Solubility**—Insoluble in water. Dissolve 1 g in 3 ml of dilute acetic acid and 7 ml of water. A clear pale yellow solution should be obtained.

3 **Melting Point**— 184° to 189° with decomposition

4 **Sulphated Ash**—Moisten 0.5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Sensitivity to Nitrate**—To 10 ml of $M/1000$ KNO_3 add one drop of dilute sulphuric acid and 1 ml of the solution prepared in Test No. 2. A distinct white crystalline precipitate should form within 30 minutes.

ANALAR OXALIC ACID



Maximum Limits of Impurities

Ash	0.02 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.005 per cent
Magnesium (Mg)	0.01 per cent
Ammonia	no reaction

1 **Description**.—Colourless crystals free from efflorescence

2 **Solubility**.—Readily soluble in alcohol. Dissolve 5 g in 50 ml of warm water, a clear colourless solution should be produced.

(Continued on next leaf)

Oxalic Acid—continued

3 **Ash**—Ignite 5 g gently, not more than 1 mg of residue should be left

4 **Chloride**.—Dissolve 2 g in 45 ml of warm water and add 5 ml of dilute nitric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced

5 **Sulphate**.—Dissolve 1 g in 20 ml of water, add 1 g of anhydrous sodium carbonate, evaporate to dryness and ignite under conditions that will not introduce sulphur. Dissolve the residue in 15 ml of hot water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 6 ml of dilute hydrochloric acid and filter. To the filtrate add 30 ml of water and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 **Nitrate**.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

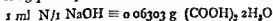
7 **Heavy Metals and Iron**.—Dissolve 2 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

8 **Calcium**.—Dissolve 1 g in 20 ml of water, add 5 ml of dilute ammonia solution and allow to stand for 4 hours. No turbidity or precipitate should be produced

9 **Magnesium**.—To the solution produced in Test No. 8 add 5 ml of ammonium phosphate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

10 **Ammonia**.—Boil 1 g with 5 ml of sodium hydroxide solution. No odour of ammonia should be perceptible

11 **Assay**.—(a) Dissolve 3 g in 50 ml of water and titrate with $N/1$ NaOH using phenolphthalein as indicator



Not less than 99.8 per cent should be indicated

(b) Dissolve 0.3 g in 100 ml of water, add 5 ml of sulphuric acid and titrate at 60° to 80° with $N/10$ KMnO_4



Not less than 99.8 per cent should be indicated

ANALAR

PERCHLORIC ACID

(sp. gr. 1.70)

72 per cent.

 $\text{HClO}_4 = 100.47$

Maximum Limits of Impurities

Non-volatile Matter	0.003	per cent
Chloride (Cl)	0.0001	per cent
Chlorate (ClO_3)	0.002	per cent
Sulphate (SO_4)	0.0005	per cent
Phosphate (PO_4)	0.0002	per cent
Silicate (SiO_2)	0.0001	per cent
Heavy Metals	passes test	
Lead (Pb)	0.00005	per cent
Copper (Cu)	0.00005	per cent
Iron (Fe)	0.0001	per cent
Manganese (Mn)	0.00005	per cent
Ammonia (NH_3)	0.0005	per cent
Nitrogen (N)	0.001	per cent
Arsenic (As_2O_3)	0.00001	per cent
	(0.1 part per million)	

1 **Description**—A clear colourless liquid

2 **Solubility**—Miscible in all proportions with water forming clear colourless solutions

3 **Non-volatile Matter**.—Evaporate 10 ml to dryness, add a few drops of sulphuric acid, and ignite gently. Not more than 0.5 mg of residue should be left

4 **Chloride**.—Dilute 6 ml with 45 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

5 **Chlorate**.—Dilute 6 ml with 40 ml of water, and add 2 ml of nitric acid, 0.1 g of sodium nitrite and 1 ml of silver nitrate solution, and allow to stand for 5 minutes. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

6 **Sulphate**.—Dilute 6 ml with 25 ml of water, neutralise with dilute ammonia solution (about 15 ml), acidify with 2 drops of the sample, add 5 ml of barium chloride solution and allow to stand for 5 hours. No turbidity or precipitate should be produced

7 **Phosphate and Silicate**.—Evaporate 3 ml in a Pyrex dish nearly to dryness, dissolve the residue in 10 ml of water, neutralise to litmus paper with a measured quantity of dilute ammonia solution, dilute to

(Continued overleaf)

PERCHLORIC ACID—continued

20 ml, add 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1, and 1 ml of phosphate reagent No. 2, and place in a water-bath at 60° for 5 minutes. Any blue colour produced should not be deeper than that produced by 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) to which has been added the same volume of dilute ammonia solution as was required in the test, sufficient of the sample to neutralise it, and containing the quantities of the reagents used in the test.

8 Heavy Metals.—Dilute 6 ml with 25 ml of water, add 20 ml of dilute ammonia solution, and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 Lead.—Dilute 6 ml with 25 ml of water, add 20 ml of dilute ammonia solution, add 1 ml of potassium cyanide solution and 5 ml of a 0.005 per cent w/v chloroform solution of diphenylthiocarbazone, and shake vigorously. Allow to separate and thoroughly shake the lower layer with 5 ml of dilute ammonia solution. Any red colour produced in the chloroform layer should not be deeper than that of the chloroform layer produced by treating 40 ml of water and 0.5 ml of standard lead solution (1 ml = 0.01 mg Pb) with 5 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 5 ml of a 0.005 per cent w/v chloroform solution of diphenylthiocarbazone and shaking vigorously.

10 Copper.—Dilute 6 ml with 20 ml of water, add 1 g of citric acid, dilute ammonia solution until alkaline (about 20 ml) and 1 ml of a 0.1 per cent aqueous solution of sodium diethyldithiocarbamate and shake with three successive portions 5 ml, 3 ml and 2 ml of carbon tetrachloride. Dry the combined carbon tetrachloride extracts with a little anhydrous sodium sulphate. Any yellow colour produced should not be greater than that obtained by treating 0.5 ml of standard copper solution (1 ml = 0.01 mg Cu) in the same manner.

11 Iron.—Dilute 6 ml with 25 ml of water and add 1 drop of N/10 KMnO_4 mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

12 Manganese.—Dilute 3 ml with 10 ml of water, add 2 ml of nitric acid and 0.5 g of sodium bismuthate, shake occasionally during 5 minutes, and allow to stand until clear. No pink colour should be produced.

13 Ammonia.—Dilute 3 ml with 35 ml of water and add 10 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not exceed that given by 2.5 ml of standard ammonia solution (1 ml = 0.01 mg NH_3) in an equal volume of solution containing the quantities of reagents used in the test.

14 Nitrogen.—Dilute 6 ml with 50 ml of water, add 1 g of powdered Devarda's Alloy, place in a Kjeldahl distillation apparatus, add

25 ml. of sodium hydroxide solution and allow to stand for 1 hour. Distil about 25 ml., collect the distillate in 10 ml. of $N/100$ H_2SO_4 , and titrate the excess of acid with $N/100$ $NaOH$, using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 0.7 ml.

15. **Arsenic.**—Dilute 12 ml with 50 ml. of water; add 10 ml. of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg. standard stain.

16. **Assay.**—Dilute 4 g. with 50 ml of water and titrate with $N/1$ $NaOH$ using phenolphthalein as indicator.

$$1 \text{ ml. } N/1 \text{ } NaOH \equiv 0.1005 \text{ g. } HClO_4$$

Not less than 71 and not more than 73 per cent. should be indicated

ANALAR

PERCHLORIC ACID

(sp. gr. 1.54)
60 per cent.

$$HClO_4 = 100.47$$

Maximum Limits of Impurities

Non-volatile Matter	0.003 per cent
Chloride (Cl)	0.0001 per cent.
Chlorate (ClO_3)	0.002 per cent.
Sulphate (SO_4)	0.0005 per cent.
Phosphate (PO_4)	0.0002 per cent
Silicate (SiO_2)	0.0001 per cent
Heavy Metals	passes test
Lead (Pb)	0.00005 per cent
Copper (Cu)	0.00005 per cent.
Iron (Fe)	0.0001 per cent
Manganese (Mn)	0.00005 per cent.
Ammonia (NH_3)	0.0005 per cent
Nitrogen (N)	0.001 per cent
Arsenic (As_2O_3)	0.00001 per cent.
	(0.1 part per million)

1. **Description.**—A clear colourless liquid.

2-16.—These tests are carried out as described for Perchloric Acid 72 per cent.

16. **Assay.**—Not less than 60 per cent. should be indicated.

ANALAR PETROLEUM ETHER

Maximum Limit of Impurity

Non volatile Matter 0.003 per cent

1 **Description** —A clear colourless mobile liquid

2 **Boiling Range** —Not less than 90 per cent should distil within the appropriate range —

- | | |
|----------------|------------------|
| (1) below 40° | (5) 60° to 80° |
| (2) 40° to 50° | (6) 80° to 100° |
| (3) 40° to 60° | (7) 100° to 120° |
| (4) 50° to 60° | (8) above 120° |

3 **Non-volatile Matter** —Evaporate 50 ml to dryness on a water bath. Not more than 1 mg of residue should be left

ANALAR PETROLEUM ETHER (Free from Aromatic Hydrocarbons)

Maximum Limits of Impurities

Non volatile Matter 0.003 per cent
Aromatic Hydrocarbons 0.5 per cent

1 **Description** —A clear colourless mobile liquid

2 **Boiling Range** —Not less than 90 per cent should distil within the appropriate range —

- | | |
|----------------|------------------|
| (1) below 40° | (5) 60° to 80° |
| (2) 40° to 50° | (6) 80° to 100° |
| (3) 40° to 60° | (7) 100° to 120° |
| (4) 50° to 60° | (8) above 120° |

3 **Non-volatile Matter** —Evaporate 50 ml to dryness on a water bath. Not more than 1 mg of residue should be left

4 **Aromatic Hydrocarbons** —Shake 10 ml with 30 ml of sulphuric acid continuously for 30 minutes. Separate the petroleum ether, wash with water and dry over calcium chloride. Mix 5 ml of this with 5 ml of freshly distilled dry aniline and warm until clear. Allow to cool very slowly and note the temperature to the nearest 0.1° at which the mixture first becomes cloudy.

Determine the clouding point for a mixture of 5 ml of the original petroleum ether (previously dried) and 5 ml of freshly distilled dry

aniline in the same manner. Each 1° difference between the two readings is equivalent to 1 per cent. of aromatic hydrocarbons.

Not more than 0.5 per cent. should be indicated.

Note—If the petroleum ether boils below the clearing point, carry out the test with a mixture of equal parts of petroleum ether, boiling range 100° to 120° (free from aromatic hydrocarbons), and the sample, and correct the result accordingly.

ANALAR

o-PHENANTHROLINE



Maximum Limit of Impurity

Sulphated Ash 0.25 per cent

Sensitivity to Iron (Fe) 1 in 10,000,000 minimum

1 **Description**—White to cream coloured crystals or crystalline powder

2 **Solubility**.—Readily soluble in alcohol. Dissolve 0.1 g in 20 ml of water. A clear colourless solution should be obtained.

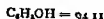
3 **Melting Point**.—97° to 102°

4 **Sulphated Ash**.—Moisten 0.2 g with sulphuric acid and ignite. Not more than 0.5 mg of residue should be left.

5 **Sensitivity**.—(a) *As redox indicator*—Add 0.5 ml of a 0.5 per cent aqueous solution to 0.5 ml of N/10 ferrous ammonium sulphate solution, and dilute with 50 ml of dilute sulphuric acid. The solution should be coloured red and this colour should be discharged on the addition of 0.1 ml of N/10 $\text{K}_2\text{Cr}_2\text{O}_7$.

(b) *As iron reagent*—Add 1 ml of a 0.5 per cent aqueous solution to a mixture of 10 ml of water, 0.1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 ml of hydroxylamine hydrochloride solution (10 per cent). The colour produced should be definitely pink when compared with a solution containing 10 ml of water and 1 ml of hydroxylamine hydrochloride solution (10 per cent) and 1 ml of the 0.5 per cent reagent solution.

ANALAR PHENOL



Maximum Limits of Impurities

Insoluble Matter	nil
Non volatile Matter	0.02 per cent
Tarry Matter	no reaction

1 **Description**—Colourless hygroscopic crystals with a characteristic odour

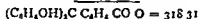
2 **Solubility**—Dissolve 5 g in 100 ml of water. A clear colourless solution should be produced

3 **Freezing Point**— 40° to 41°

4 **Non-volatile Matter**—Evaporate 5 g on a water bath. Not more than 1 mg of residue should be left

5 **Tarry Matter**—Dissolve 5 g in 15 ml of sodium hydroxide solution. A clear colourless solution free from tarry odour should be obtained

ANALAR PHENOLPHTHALEIN



Maximum Limits of Impurities

Alcohol insoluble Matter	nil
Alkali insoluble Matter	nil
Sulphated Ash	0.05 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent

1 **Description**—A white crystalline powder

2 **Solubility**—Almost insoluble in water. Completely soluble in alcohol. One gram should dissolve completely in 8 ml of N/1 NaOH and 100 ml of water forming a clear deep red solution

3 **Melting Point**— 258° to 261°

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

5 **Chloride**—Shake 1 g with 50 ml of water and 1 ml of dilute nitric acid for 5 minutes and filter, and to the filtrate add 1 ml of silver nitrate solution. No opalescence should be produced

6 **Sulphate.**—Shake 1 g with 50 ml of water and 1 ml of dilute hydrochloric acid for 5 minutes and filter, to the filtrate add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

ANALAR

PHENYLHYDRAZINE HYDROCHLORIDE



Maximum Limits of Impurities

Insoluble Matter	passes test
Sulphated Ash	0.05 per cent

1 **Description.**—White or pale cream crystalline powder or leaflets.

2 **Solubility.**—Dissolve 1 g in 50 ml of water. An almost clear and colourless solution should be produced.

3 **Sulphated Ash.**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

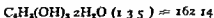
4 **Assay.**—Dissolve 0.2 g in 25 ml of water, add 20 ml of dilute hydrochloric acid and 5 ml of potassium cyanide solution and titrate with M/20 KIO_3 until the dark brown solution which is formed becomes light brown, then add 5 ml of starch solution and continue the titration until the blue colour disappears.



Not less than 98 per cent should be indicated.

ANALAR

PHLOROGLUCINOL



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Resorcinol	no reaction
Diresorcinol	no reaction

1 **Description.**—White or pale cream coloured crystals.

2 **Solubility.**—Readily soluble in alcohol. Dissolve 1 g in 50 ml of water, a clear, not more than faintly yellow solution should be produced.

(Continued on leaf)

PHLOROGLUCINOL—continued

3 **Melting Point.**— 218° to 219° , after removal of water of crystallisation by drying at 110° for 1 hour

4 **Sulphated Ash**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left

5 **Resorcinol**—Heat 0.1 g with 0.1 g of phthalic anhydride and 0.5 g of zinc chloride, cool, dissolve the melt in 50 ml of water and add 1 ml of sodium hydroxide solution. No fluorescence should be observed

6 **Diresorcinol.**—Boil 0.1 g with 2 ml of acetic anhydride, cool and layer on sulphuric acid. No violet ring should appear

ANALAR PHOSPHOMOLYBDIC ACID

Approximate formula $H_3PO_4 \cdot 12MoO_3 \cdot 24H_2O = 2257.8$

Maximum Limits of Impurities

Nitrate (NO_3)	0.02 per cent
Heavy Metals (Pb)	0.002 per cent
Calcium (Ca)	0.02 per cent
Ammonia	no reaction
Alkalies (Na)	0.3 per cent

1 **Description**—Yellow crystals or a crystalline powder

2 **Solubility (Ammonia)**—Dissolve 5 g in 50 ml of water and boil. A clear solution should be produced which should remain clear on the addition of 5 ml of nitric acid

3 **Nitrate**—Dissolve 0.5 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

4 **Heavy Metals**—Dissolve 0.5 g in 40 ml of water, add 1 ml of dilute hydrochloric acid, 0.1 ml of $N/10$ $KMnO_4$ and heat to boiling, cool and add 0.1 g of citric acid, 5 ml of dilute ammonia solution and 1 drop of sodium sulphide solution. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2

5 **Calcium**—Dissolve 1 g in 10 ml of water, add 5 ml of dilute ammonia solution and 1 ml of ammonium oxalate solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 **Alkalies**—Dissolve 1 g in 50 ml of boiling water and add slowly 20 ml of a 4 per cent solution of benzidine in $N/1$ HCl , cool, and allow

to stand at about 0° for 2 hours. Add 20 ml of a 2 per cent solution of 8-hydroxyquinoline in N/1 acetic acid and allow to stand at about 0° overnight. Filter through a sintered glass crucible and wash twice with 20 ml portions of water containing 1 drop of N/1 HCl. Evaporate the filtrate to 20 ml, cool and filter. Evaporate the filtrate to dryness, moisten with sulphuric acid and ignite gently. Not more than 9 mg of residue should be left.

ANALAR PHOSPHORIC ACID



Maximum Limits of Impurities

Chloride (Cl)	0.0003 per cent
Sulphate (SO_4)	0.003 per cent
Nitrate (NO_3)	0.001 per cent
Lead (Pb)	0.001 per cent
Iron (Fe)	0.002 per cent
Calcium and Magnesium (Ca + Mg)	0.006 per cent
Oxygen absorbed (O)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1. **Description.**—A clear colourless syrupy liquid.
2. **Solubility.**—Miscible in all proportions with water, and with alcohol forming clear colourless solutions.
3. **Weight per ml. at 20° .**—1.740 to 1.750 g.
4. **Chloride.**—Dilute 2 ml with 50 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced.
5. **Sulphate.**—Dilute 2 ml with 50 ml of water, add 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.
6. **Nitrate.**—Dilute 1 ml with 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.
7. **Lead.**—To 4 g add 30 ml of dilute ammonia solution and 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 1 drop of sodium sulphide solution. Any brown colour produced should not be deeper than that produced by the addition of 1 drop of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample, 15 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 2 ml of standard lead solution (1 ml = 0.01 mg Pb).

(Continued overleaf)

PHOSPHORIC ACID—continued

8 Iron.—Dilute 2 ml. with water to produce 35 ml. To 5 ml. of this solution add 5 ml. of water, 1 ml. of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 ; mix, add 5 ml. of ammonium thiocyanate solution and 10 ml. of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml. of standard iron solution (1 ml. = 0.01 mg. Fe) in the same manner.

9 Calcium and Magnesium.—Dilute 2 ml. with 10 ml. of water, add 20 ml. of dilute ammonia solution and 5 ml. of ammonium oxalate solution and heat on a water-bath for 1 hour. No turbidity or precipitate should be produced.

10 Oxygen Absorption.—Dilute 5 ml. with 20 ml. of water, add 0.1 ml. of N/10 KMnO_4 and heat on a water-bath for 5 minutes. The pink colour should not entirely disappear.

11 Arsenic.—Dilute 10 g. with 50 ml. of water, add 10 ml. of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg. standard stain.

12 Assay.—Dilute 4 g. with 100 ml. of water and titrate with N/1 NaOH to pH 4.5 using bromocresol green as indicator.

$$1 \text{ ml. N/1 NaOH} \equiv 0.0080 \text{ g. H}_2\text{PO}_4$$

Not less than 88 per cent. should be indicated.

ANALAR PHOSPHORUS PENTACHLORIDE

$$\text{PCl}_5 = 208.27$$

1 Description.—A white to pale yellow fuming deliquescent mass. Decomposed violently by water forming a mixture of phosphoric and hydrochloric acids.

2 Assay.—Dissolve 0.1 g. with suitable precautions in 50 ml. of N/10 NaOH , and back titrate with N/10 H_2SO_4 to pH 4.5 using bromocresol green as indicator.

$$1 \text{ ml. of N/10 NaOH} = 0.003471 \text{ g. PCl}_5$$

Not less than 99 per cent. should be indicated.

To the neutralised liquid add 5 ml. of nitric acid, and 50 ml. of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator.

$$1 \text{ ml. of N/10 AgNO}_3 \equiv 0.004165 \text{ g. PCl}_5$$

Not less than 99 per cent. should be indicated.

ANALAR PHOSPHOTUNGSTIC ACID



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.002 per cent
Ammonia (NH_3)	0.001 per cent
Alkalis (Na)	0.2 per cent

1 **Description.**—White or cream coloured crystals or crystalline powder

2 **Solubility**—Dissolve 1 g in 50 ml of water. An almost clear and colourless solution should be produced.

3 **Chloride**—Dissolve 1 g in 50 ml of water, filter if necessary and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Nitrate**—Dissolve 1 g in 10 ml of warm water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

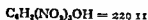
5 **Ammonia**—Dissolve 1 g in 45 ml of water and add 5 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any yellow colour produced should not be greater than that given by the addition of 5 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 45 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

6 **Alkalis**—Dissolve 1 g in 100 ml of warm water, add 0.1 ml of dilute hydrochloric acid, 0.1 ml of dilute sulphuric acid and then, with stirring, 1.25 g of benzidine dissolved in 3 ml of dilute hydrochloric acid and 50 ml of water. Allow to stand for 5 minutes, filter and evaporate the filtrate to dryness. To the residue add a few drops each of sulphuric acid and nitric acid, ignite gently, moisten with sulphuric acid, reignite and weigh the residue. Not more than 6 mg should be obtained.

ANALAR

PICRIC ACID

(2:4:6-Trinitrophenol)



Maximum Limits of Impurities

Sulphated Ash	0.1 per cent
Chloride (Cl)	0.0005 per cent
Sulphate and Sulphonate (SO_4)	0.005 per cent
Organic Impurities	passes test

1 Description—Pale yellow crystals. Picric acid is moistened with water before issue. The tests and specification apply to the dry substance.

2 Solubility—(a) Dissolve 1 g in 100 ml of hot water and allow to cool. A clear yellow solution should be produced.

(b) One gram should dissolve to a clear solution in 20 ml of benzene.

3 Melting Point.—122° to 123°

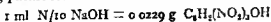
4 Sulphated Ash—Ignite 1 g gently until fully charred, moisten with sulphuric acid and gently reignite. Not more than 1 mg of residue should be left.

5 Chloride.—Dissolve 2 g in 40 ml of boiling water and 1 ml of dilute nitric acid, cool and filter, to the filtrate add 10 ml of water and 1 ml of silver nitrate solution. No opalescence should be produced.

6 Sulphate and Sulphonate—Add 2 g to 10 ml of nitric acid and evaporate to dryness on a water-bath. Dissolve the residue in 40 ml of boiling water and 2 ml of dilute hydrochloric acid, cool and filter, to the filtrate add 10 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

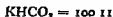
7 Organic Impurities—Dissolve 0.2 g in 20 ml of water, add 0.5 ml of sodium hydroxide solution, allow to stand for 15 minutes and dilute with 30 ml of water. The colour of the resulting solution should not be deeper than that of a solution prepared by dissolving 0.4 g of the same picric acid in 50 ml of water.

8 Assay—Dissolve 1 g in 100 ml of water and titrate with N/10 NaOH using phenol red as indicator.



Not less than 99.8 per cent should be indicated.

ANALAR POTASSIUM BICARBONATE



Maximum Limits of Impurities

Carbonate (K_2CO_3)	1.0	per cent
Chloride (Cl)	0.005	per cent
Sulphate (SO_4)	0.005	per cent
Nitrate (NO_3)	0.002	per cent
Phosphate (PO_4)	0.001	per cent
Silicate (SiO_2)	0.005	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent
Ammonia (NH_3)	0.0005	per cent
Arsenic (As_2O_3)	0.0001	per cent
(1 part per million)		

- 1 **Description**—Colourless crystals or crystalline powder
- 2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.
- 3 **Carbonate**—The reaction of a solution of 1 g in 100 ml of carbon dioxide free water should not be greater than pH 8.5 using thymol blue as indicator.
- 4 **Chloride**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.
- 5 **Sulphate**—Dissolve 5 g in 100 ml of water add 12 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.
- 6 **Nitrate**—Dissolve 1 g in 10 ml of dilute sulphuric acid add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.
- 7 **Phosphate**—Dissolve 2 g in 10 ml of water in a platinum dish and neutralise with dilute sulphuric acid (about 3 ml) add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder for Test No. 8) add 2 ml of dilute sulphuric acid 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the standard colour defined in appendix 2.
- 8 **Silicate**—To 2 ml of the solution retained from Test No. 7 add 20 ml of water 1 ml of dilute sulphuric acid 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath

(Continued overleaf)

POTASSIUM BICARBONATE—continued

at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2

9 **Heavy Metals and Iron**—Dissolve 2 g in 5 ml of dilute hydrochloric acid, add 40 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

10 **Ammonia**—Dissolve 2 g in 50 ml of water, add 2 ml of hydrochloric acid, boil to remove carbon dioxide, cool and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not be greater than that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

11 **Arsenic**—Dissolve 5 g in 15 ml of brominated hydrochloric acid and 45 ml of water, add a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

12 **Assay**—Dissolve 4 g in 50 ml of water and titrate with N/1 HCl using bromophenol blue as indicator



Not less than 99.5 per cent should be indicated

ANALAR**POTASSIUM BISULPHATE****Maximum Limits of Impurities**

Chloride (Cl)	0.0005 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description**—Opaque white masses

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced

4 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

6 **Ammonia**—Dissolve 1 g in 50 ml of water and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

7 **Arsenic**—Dissolve 10 g in 50 ml of water, add 5 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

8 **Assay**—Dissolve 5 g in 50 ml of water and titrate with N/1 NaOH using methyl red as indicator.

$$1 \text{ ml N/1 NaOH} \equiv 0.1362 \text{ g KHSO}_4$$

Not less than 99 per cent and not more than 102 per cent should be indicated.

ANALAR POTASSIUM BROMATE



Maximum Limits of Impurities

Bromide (Br)	0.01 per cent
Sulphate (SO_4)	0.005 per cent
Moisture	0.1 per cent

1 **Description**—A white crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Bromide**—Dissolve 1 g in 20 ml of water, add 1 g of citric acid and 0.5 ml of chloroform. Shake vigorously and allow to separate. The chloroform should not be coloured yellow or brown.

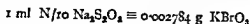
4 **Sulphate**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand in a warm place for 1 hour. No turbidity or precipitate should be produced.

5 **Moisture**—Dry 5 g of the finely powdered material at 110° for 1 hour. The loss in weight should not exceed 5 mg.

(Continued overleaf)

POTASSIUM BROMATE—continued

6 Assay.—Dissolve 0.1 g of the dried material, obtained in Test No 5, in 25 ml of water, add 3 g of potassium iodide and 10 ml of dilute hydrochloric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$



Not less than 99.9 per cent should be indicated

ANALAR POTASSIUM BROMIDE



Maximum Limits of Impurities

Free Alkali	0.2 ml N/1 per cent
Chloride (Cl)	0.25 per cent
Bromate (BrO_3)	0.001 per cent
Iodide (I)	0.05 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Moisture	0.5 per cent

1 Description—Colourless crystals

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Free Alkali—Dissolve 5 g in 50 ml of carbon dioxide free water and add 0.2 ml of phenolphthalein solution. The solution should be colourless or should not require more than 0.1 ml of N/10 HCl to render it so

4 Chloride—Dissolve 4 g in 75 ml of water and 25 ml of nitric acid, boil gently and pass a current of air through the liquid until all the liberated bromine is removed. Cool, add 10 ml of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator. Not less than 7.2 ml of N/10 NH_4SCN should be required

5 Bromate—Dissolve 1 g in 10 ml of water and add 1 ml of dilute sulphuric acid. No yellow colour should be produced

6 Iodide—Dissolve 1 g in 10 ml of water, add 0.05 ml of ferric chloride solution and 1 ml of starch solution and allow to stand for 10 minutes. No blue colour should be produced

7 Sulphate—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

8 Heavy Metals and Iron—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

9 Moisture—Dry 5 g of the finely powdered material at 130° for 1 hour. The loss in weight should not exceed 25 mg

10 Assay—Dissolve 0.5 g of the dried material, obtained in Test No 9, in 50 ml of water, add 50 ml of N/10 AgNO₃ and 10 ml of dilute nitric acid and titrate the excess of silver with N/10 NH₄SCN using ferric ammonium sulphate as indicator. Correct the titration figure for the amount of chloride found in Test No 4



Not less than 99 per cent should be indicated

ANALAR POTASSIUM CARBONATE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO ₄)	0.005 per cent
Nitrate (NO ₃)	0.002 per cent
Phosphate (PO ₄)	0.001 per cent
Silicate (SiO ₂)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Ammonia (NH ₃)	0.0002 per cent
Arsenic (As ₂ O ₃)	0.0001 per cent
	(1 part per million)
Moisture	2.0 per cent

1 Description—A hygroscopic white granular powder

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Chloride—Dissolve 2 g in 40 ml of water and add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

4 Sulphate—Dissolve 5 g in 100 ml of water, add 20 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced

(Continued overleaf)

POTASSIUM CARBONATE—continued

5 Nitrate.—Dissolve 1 g in 10 ml of dilute sulphuric acid, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Phosphate.—Dissolve 2 g in 10 ml of water in a platinum dish, neutralise with dilute sulphuric acid (about 5 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder for Test No 7) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

7 Silicate.—To 2 ml of the solution retained from Test No 6 add 20 ml of water, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

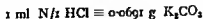
8 Heavy Metals and Iron.—Dissolve 1 g in 3 ml of dilute hydrochloric acid, add 40 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 Ammonia.—Dissolve 5 g in 45 ml of water, add 8 ml of hydrochloric acid, boil to remove carbon dioxide, cool and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not be greater than that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

10 Arsenic.—Dissolve 5 g in 50 ml of water, add 16 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

11 Moisture.—Dry 3 g at about 300° for 15 minutes. The loss in weight should not exceed 60 mg.

12 Assay.—Dissolve the dried material obtained in Test No 11 in 50 ml of water and titrate with N/1 HCl using bromophenol blue as indicator.



Not less than 99.9 per cent should be indicated.

ANALAR POTASSIUM CHLORATE



Maximum Limits of Impurities

Chloride (Cl)	0.0005 per cent
Bromate (BrO_3)	0.025 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Calcium (Ca)	0.005 per cent
Arsenic (As_2O_3)	0.00004 per cent
	(0.4 part per million)

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 20 ml of water should be neutral to litmus paper.

4 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Bromate**—Ignite 1 g and dissolve the residue in 10 ml of water, add 1 ml of dilute sulphuric acid and 0.1 g of ammonium persulphate, allow to stand for 5 minutes, add 2 ml of chloroform and shake. No colour should appear in the chloroformic layer.

6 **Sulphate**—Dissolve 2 g in 50 ml of water, add 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

7 **Heavy Metals and Iron**—Dissolve 5 g in 45 ml of hot water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8 **Calcium**—Dissolve 1 g in 20 ml of water, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution and allow to stand for 1 hour. No turbidity should be produced.

9 **Arsenic**—To 5 g add 20 ml of water and 22 ml of hydrochloric acid, warm gently until chlorine ceases to be evolved, cool, add 20 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain.

10 **Assay**—Dissolve 0.3 g in 20 ml of water, add 1 g of sodium nitrite and 5 ml of dilute sulphuric acid, boil for 3 minutes, cool, add 5 ml of nitric acid and 50 ml of $\text{N}/10 \text{ AgNO}_3$, filter, wash and titrate.

(Continued overleaf)

POTASSIUM CHLORATE—*continued*

the filtrate and washings with $N/10$ NH_4SCN using ferric ammonium sulphate as indicator

1 ml $N/10$ $AgNO_3$ — 0.01225 g $KClO_3$

Not less than 99.5 per cent. should be indicated

ANALAR**POTASSIUM CHLORIDE**

$KCl = 74.55$

Maximum Limits of Impurities

Free Acid	0.05 ml $N/1$ per cent
Free Alkali	0.05 ml $N/1$ per cent
Sulphate (SO_4)	0.003 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium (Ba)	0.003 per cent
Calcium (Ca)	0.005 per cent
Magnesium (Mg)	0.005 per cent
Ammonia (NH_3)	0.001 per cent
Moisture	0.3 per cent

1 **Description**—Small white crystals or a crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of $N/10$ $NaOH$ or $N/10$ HCl to render it so.

4 **Sulphate**—Dissolve 5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 24 hours. No turbidity or precipitate should be produced.

5 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Heavy Metals and Iron**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

7 **Barium**—Dissolve 5 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 2 hours. No turbidity or precipitate should be produced.

8 Calcium—Dissolve 2 g in 20 ml. of water add 2 ml. of dilute ammonia solution and 2 ml. of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

9 Magnesium—Dissolve 2 g in 10 ml. of water, add 5 ml. of dilute ammonia solution and 5 ml. of ammonium phosphate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

10 Ammonia—Dissolve 1 g in 50 ml. of water and add 2 ml. of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml. of Nessler's reagent to 50 ml. of water containing 1 ml. of standard ammonia solution (1 ml. = 0.01 mg. NH_3)

11 Moisture—Dry 5 g. of the finely powdered material for 1 hour at 150° . The loss in weight should not exceed 15 mg.

12 Assay—Dissolve 0.3 g. of the dried material from Test No. 11 in 50 ml. of water and titrate with N/10 AgNO_3 using potassium chromate as indicator

$$1 \text{ ml. N/10 AgNO}_3 \equiv 0.007455 \text{ g. KCl}$$

Not less than 99.8 per cent should be indicated

ANALAR POTASSIUM CHROMATE

$$\text{K}_2\text{CrO}_4 = 194.20$$

Maximum Limits of Impurities

Free Alkali	passes test
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.02 per cent
Aluminium (Al)	0.003 per cent
Calcium (Ca)	0.005 per cent

1 Description—Lemon yellow crystals or crystalline powder

2 Solubility—Dissolve 5 g in 50 ml. of water. A clear yellow solution should be produced

3 Free Alkali—Dissolve 1 g in 25 ml. of carbon dioxide free water and add 0.5 ml. of thymolphthalein solution. No change in colour should be produced

4 Chloride—Dissolve 1 g in 45 ml. of water and add 5 ml. of nitric acid and 0.5 ml. of silver nitrate solution. No opalescence should be produced

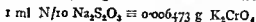
5 Sulphate—Dissolve 1 g in 50 ml. of water add 3 ml. of dilute hydrochloric acid and 0.5 ml. of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced

(Continued overleaf)

POTASSIUM CITRATE—continued

6 Aluminium and Calcium.—Dissolve 2 g in 40 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

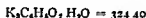
7 Assay.—Dissolve 0.3 g in 100 ml of water, add 2 g of potassium iodide and 20 ml of dilute hydrochloric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.



Not less than 99 per cent should be indicated.

ANALAR

POTASSIUM CITRATE



Maximum Limits of Impurities

Free Acid	1.0 ml N/1 per cent
Free Alkali	1.0 ml N/1 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Reducing Substances	passes test
Organic Impurities	passes test

1. Description—Small white crystals or a crystalline powder.

2. Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3. Reaction—Boil 5 g with 50 ml of water and cool. The solution should be neutral to thymol blue or should not require more than 0.5 ml of N/10 NaOH or N/10 HCl to render it so.

4. Chloride—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

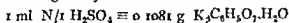
5. Sulphate—Dissolve 1 g in 30 ml of water, add 3 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6. Heavy Metals and Iron—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 Reducing Substances.—Dissolve 10 g in 50 ml of hot water, add 4 g of anhydrous sodium carbonate and 10 ml of cupric sulphate solution and boil for 5 minutes. No turbidity or precipitate should be produced.

8 Organic Impurities—Heat 2 g with 10 ml of sulphuric acid in a boiling water-bath for 1 hour. Not more than a pale yellow colour should be produced.

9 Assay.—Ignite gently 4 g in a platinum dish until decomposition is complete. Boil the residue with 100 ml of water and 50 ml of N/1 H_2SO_4 , filter and wash with water. Titrate the filtrate and washings with N/1 NaOH using methyl red as indicator.



Not less than 99 per cent should be indicated.

ANALAR POTASSIUM CYANIDE



Maximum Limits of Impurities

Chloride (Cl)	0.5 per cent
Sulphate (SO_4)	0.01 per cent
Sulphide	no reaction
Ferrocyanide ($\text{Fe}(\text{CN})_6$)	0.005 per cent
Thiocyanate (SCN)	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Heavy Metals (Cu)	0.001 per cent
Sodium	no reaction

1 Description—A white crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water, a clear colourless solution should be produced. Five grams should dissolve in 25 ml of hot 60 per cent alcohol.

3 Chloride.—Dissolve 1 g in 50 ml of water, add 25 ml of formaldehyde solution, 5 ml of nitric acid and 10 ml of N/10 AgNO_3 , filter, wash with water and titrate the filtrate and washings with N/10 NH_4SCN using ferric ammonium sulphate as indicator. Not less than 8.6 ml of N/10 NH_4SCN should be required.

4 Sulphate—Dissolve 1 g in 50 ml of water, add 5 ml of dilute hydrochloric acid, boil gently for 5 minutes, cool, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

(Continued overleaf)

POTASSIUM CYANIDE—continued

5 **Sulphide**—Dissolve 1 g in 20 ml of water and add 5 ml of dilute ammonia solution and 1 drop of potassium plumbite solution. The solution should not darken in colour.

6 **Ferrocyanide and Thiocyanate**.—Dissolve 1 g in 25 ml of water add 5 ml of dilute hydrochloric acid and 1 drop of ferric chloride solution and allow to stand for 10 minutes. No blue or red colour should be produced.

7 **Heavy Metals**—Dissolve 1 g in 50 ml of water and pass hydrogen sulphide through the solution for a few seconds. No brown colour should be produced nor should any appear on the further addition of 5 ml of dilute hydrochloric acid.

8 **Sodium**—Heat a little of the salt on platinum wire in a Bunsen flame. Not more than a transient yellow flame should be produced.

9 **Assay**—Dissolve 0.5 g in 50 ml of water add 5 ml of dilute ammonia solution and 1 drop of potassium iodide solution and titrate with N/10 AgNO_3 until a faint permanent turbidity appears.

$$1 \text{ ml N/10 AgNO}_3 \equiv 0.01302 \text{ g KCN}$$

Not less than 96 per cent should be indicated.

ANALAR**POTASSIUM DICHROMATE**

$$\text{K}_2\text{Cr}_2\text{O}_7 = 294.21$$

Maximum I units of Impurities

Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Aluminium (Al)	0.003 per cent
Calcium (Ca)	0.005 per cent
Sodium	no reaction
Moisture	0.05 per cent

1 **Description**.—Orange red crystals or crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear orange red solution should be produced.

3 **Chloride**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 0.5 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate**—Dissolve 2 g in 45 ml of water add 7 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Aluminium and Calcium**—Dissolve 2 g in 40 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium oxalate

solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

6 **Sodium.**—Moisten a little of the powdered salt with hydrochloric acid and heat in a flame on a platinum wire. No yellow flame should be produced.

7 **Moisture.**—Dry 10 g for 1 hour at 120° . The loss in weight should not exceed 5 mg.

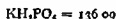
8 **Assay.**—Dissolve 0.2 g of the dried material from Test No. 7 in 100 ml of water, add 2 g of potassium iodide and 20 ml of dilute hydrochloric acid and titrate the liberated iodine with $N/10$ $Na_2S_2O_3$ using starch solution as indicator.



Not less than 99.9 per cent should be indicated.

ANALAR

POTASSIUM DIHYDROGEN PHOSPHATE



Maximum Limits of Impurities

Reaction	pH 4.5
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Lead (Pb)	0.001 per cent
Iron (Fe)	0.002 per cent
Ammonia (NH_3)	0.005 per cent
Moisture	0.1 per cent

1 **Description.**—A white crystalline powder.

2 **Solubility.**—Dissolve 2 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction.**—The reaction of a solution of 1 g in 100 ml of carbon dioxide-free water should be pH 4.5 using bromocresol green as indicator.

4 **Chloride.**—Dissolve 2 g in 50 ml of water and add 2 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate.**—Dissolve 2.5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

6 **Lead.**—Dissolve 7 g in 30 ml of hot water and 15 ml of dilute ammonia solution, add 1 ml of potassium cyanide solution, dilute with

(Continued overleaf)

POTASSIUM DIHYDROGEN PHOSPHATE—*continued*

water to 50 ml and add 2 drops of sodium sulphide solution. Any brown colour produced should not be deeper than that produced by the addition of 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing 2 g of the sample, 15 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 5 ml of standard lead solution (1 ml = 0.01 mg Pb).

7 Iron—Dissolve 1 g in 8 ml of water and add 4 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix., add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

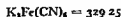
8 Ammonia—Dissolve 0.2 g in 40 ml of water add 2 ml of sodium hydroxide solution and 1 ml Nessler reagent. Any yellow colour produced should not exceed that given by 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3) in an equal volume of solution containing the quantities of reagents used in the test.

9 Moisture—Dry 5 g at 110° for 1 hour. The loss in weight should not exceed 5 mg.

10 Assay—Dissolve the dried material from Test No. 9 in 100 ml of water and titrate with N/1 NaOH to pH 9.2 using thymol blue as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR**POTASSIUM FERRICYANIDE****Maximum Limits of Impurities**

Chloride (Cl)	0.02 per cent
Sulphate (SO_4)	0.005 per cent
Ferrocyanide ($\text{Fe}(\text{CN})_6$)	0.005 per cent

1 Description—Ruby red crystals.

2 Solubility—Dissolve 5 g in 50 ml of water. A clear yellow green solution should be produced.

3 Chloride—Dissolve 1 g in 85 ml of water add 15 ml of cupric sulphate solution and filter. To 50 ml of the filtrate add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 **Sulphate.**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

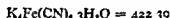
5 **Ferrocyanide.**—Rapidly wash 1 g with water, then dissolve in 100 ml of water and add 1 drop of ferric ammonium sulphate solution. No blue colour should be produced

6 **Assay.**—Dissolve 1 g in 50 ml of water, add 2 g of potassium iodide, 3 g of zinc sulphate and 1 ml of dilute hydrochloric acid, and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$

$$1 \text{ ml N/10 Na}_2\text{S}_2\text{O}_3 \equiv 0.03293 \text{ g K}_3\text{Fe(CN)}_6$$

Not less than 99 per cent should be indicated

ANALAR POTASSIUM FERROCYANIDE



Maximum Limits of Impurities

Chloride (Cl)	0.02 per cent
Sulphate (SO_4)	0.005 per cent

1 **Description.**—Pale yellow crystals or crystalline powder

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear yellow solution should be produced

3 **Chloride.**—Dissolve 1 g in 85 ml of water, add 15 ml of cupric sulphate solution and filter. To 50 ml of the filtrate add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

4 **Sulphate.**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Assay.**—Dissolve 1 g in 400 ml of water, add 10 ml of sulphuric acid and titrate with N/10 KMnO_4

$$1 \text{ ml N/10 KMnO}_4 \equiv 0.04224 \text{ g K}_3\text{Fe(CN)}_6 \cdot 3\text{H}_2\text{O}$$

Not less than 99 per cent should be indicated.

ANALAR

POTASSIUM HYDROGEN PHTHALATE



Maximum Limits of Impurities

Reaction of a M/20 solution	pH 3.96 to 3.98
Chloride (Cl)	0.001 per cent
Sulphate (SO ₄)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Moisture	0.1 per cent

1 **Description.**—A white crystalline powder

2 **Solubility.**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Reaction.***—The pH of an M/20 solution in carbon dioxide free water at 20° should lie between 3.96 and 3.98, the determination being made electrometrically by immersing a freshly ignited platinum electrode in a portion of the solution which has been saturated with quinhydrone and combining this element with a saturated calomel half cell by means of an agar bridge saturated with potassium chloride. If the E.M.F. of this cell is *E* millivolts

$$\text{pH of solution at } 20^\circ = \frac{453.3 - E}{58.10}$$

4 **Chloride.**—Dissolve 1 g in 20 ml of warm water and 2 ml of dilute nitric acid, cool, filter and to the filtrate add 30 ml of water and 1 ml of silver nitrate solution. No opalescence should be produced.

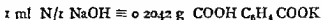
5 **Sulphate.**—Dissolve 1 g in 20 ml of warm water and 2 ml of dilute hydrochloric acid, cool, filter, and to the filtrate add 30 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron.**—Dissolve 1 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Moisture.**—Dry 10 g at 110° for 1 hour. The loss in weight should not exceed 10 mg.

*The provisions concerning the pH of the solution of Potassium Hydrogen Phthalate Analak will automatically be revised, if necessary, to comply with the forthcoming British Standard Specification dealing with pH standards, as soon as that Specification is published.

8 Assay.—Dissolve 9 g of the dried material from Test No 7 in 100 ml. of water and titrate with N/1 NaOH using phenolphthalein as indicator



Not less than 99.9 per cent and not more than 100.1 per cent should be indicated

ANALAR

POTASSIUM HYDROGEN TARTRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent.
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Moisture	0.1 per cent

1 Description.—A white crystalline powder

2 Solubility.—Dissolve 1 g in 50 ml of warm water. A clear colourless solution should be produced

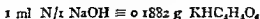
3 Chloride.—Dissolve 1 g in 50 ml of water and 2 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced

4 Sulphate.—Dissolve 1 g in 50 ml of water and 2 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 Heavy Metals and Iron.—Dissolve 1 g in 40 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

6 Moisture.—Dry 10 g at 110° for 1 hour. The loss in weight should not exceed 10 mg

7. Assay.—Suspend 8 g of the dried material from Test No 6 in 200 ml of hot water and titrate with N/1 NaOH using phenolphthalein as indicator and boiling well towards the end of the titration



Not less than 99.9 per cent should be indicated.

ANALAR POTASSIUM HYDROXIDE



Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.001 per cent
Silicate (SiO_2)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Aluminium (Al)	0.005 per cent
Zinc (Zn)	0.002 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)
Carbonate (K_2CO_3)	2.0 per cent

1 **Description.**—White deliquescent sticks or pellets

2 **Insoluble Matter.**—Dissolve 50 g., accurately weighed, in water, cool and dilute to 500 ml using carbon dioxide free water throughout. Not more than a very small amount of insoluble matter should be visible.

This solution is referred to as the "sample solution" in the remaining clauses of this specification.

3 **Chloride.**—Dilute 10 ml of the sample solution with 35 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not exceed the "standard opalescence" defined in appendix 2.

4 **Sulphate.**—To 50 ml of the sample solution add 17 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Nitrate.**—To 10 ml of the sample solution add cautiously 1 ml of sulphuric acid, cool, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Phosphate.**—Dissolve 2 g in 20 ml of water in a platinum dish, neutralise with dilute sulphuric acid (about 6 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder for Test No. 7) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

7. **Silicate.**—To 1 ml of the solution retained from Test No 6 add 20 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2

8. **Heavy Metals and Iron.**—To 10 ml of the sample solution add 5 ml of dilute hydrochloric acid, 10 ml of dilute ammonia solution and 25 ml of water and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

9. **Aluminium.**—To 10 ml of the sample solution add 10 ml of dilute acetic acid and 1 ml of a 0.1 per cent aqueous solution of ammonium aurine-tricarboxylate ("aluminon"), allow to stand for 5 minutes and then add 10 ml of ammonium carbonate solution. Any pink colour produced should not be deeper than that of a solution prepared in the following manner: To 15 ml of water add 0.5 ml of standard aluminium solution (1 ml = 0.1 mg Al), 1 g of ammonium acetate, 5 ml of dilute acetic acid, 1 ml of "aluminon" solution, and after a lapse of 5 minutes, 10 ml of ammonium carbonate solution

10. **Zinc.**—Neutralise 20 ml of the sample solution with dilute sulphuric acid (about 6 ml), add 1 drop in excess, and cool. Add 1 drop of ammonium thiocyanate solution and 0.2 ml of a 0.05 per cent alcoholic solution of *p*-dimethylaminostyryl β -naphthiazole methyl iodide. The colour produced immediately should not be pink when compared with a solution containing 25 ml of water, 1 drop of dilute sulphuric acid, 1 drop of ammonium thiocyanate solution and 0.2 ml of the reagent solution

Alternatively the following polarographic procedure may be employed—Dissolve 10 g in 50 ml of water, de-oxygenate, and polarograph over the range -0.9 volt to -1.4 volt. Return the solution in the polarographic cell, together with the mercury, to the solution under test add 0.2 ml of standard zinc solution (1 ml = 1 mg Zn), mix well and polarograph as before. The wave height obtained in the first experiment should not be greater than the increase in height obtained in the second experiment

11. **Ammonia.**—Dilute 10 ml of the sample solution with 40 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

12. **Arsenic.**—To 50 ml of the sample solution add 18 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

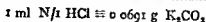
13. **Assay and Carbonate.**—To 25 ml of the sample solution add 2 ml of barium chloride solution and titrate with $\text{N}/1$ HCl using phenolphthalein as indicator

1 ml $\text{N}/1$ $\text{HCl} \equiv 0.05610$ g KOH

(Continued overleaf)

POTASSIUM HYDROXIDE—*continued*

Then add bromophenol blue and continue the titration with N/1 HCl



Not less than 85 per cent of KOH, and not more than 2 per cent of K_2CO_3 should be indicated

ANALAR POTASSIUM IODATE



Maximum Limits of Impurities

Chlorate (ClO_3)	0.05 per cent
Iodide (I)	0.001 per cent
Sulphate (SO_4)	0.05 per cent
Moisture	0.1 per cent

1 **Description**—A white crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3 **Reaction**—Dissolve 1 g in 20 ml of water. The solution should be neutral to litmus.

4 **Chlorate**—Dissolve 0.5 g in 25 ml of water, add 5 ml of dilute nitric acid and 15 ml of silver nitrate solution. Shake well and filter. To the filtrate add 10 ml of formaldehyde solution. Boil for 2 minutes and cool. Any opalescence produced should not exceed that given by 1 ml of standard chloride solution (1 ml = 0.1 mg Cl) with 35 ml of water when treated with 5 ml of dilute nitric acid, 5 ml of silver nitrate solution and 10 ml of formaldehyde solution and boiled for 2 minutes.

5 **Iodide**—Dissolve 1 g in 20 ml of water, add 1 g of citric acid and 0.5 ml of chloroform, shake vigorously and allow to separate. The chloroform should not be coloured pink or violet.

6 **Sulphate**—Dissolve 1 g in 50 ml of water, add 0.6 g of hydroxylamine hydrochloride and boil until free iodine is removed, cool, dilute to 50 ml, add 0.5 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 15 minutes. No turbidity or precipitate should be produced.

7 **Moisture**—Dry 5 g of the finely powdered material at 110° for 1 hour. The loss in weight should not exceed 5 mg.

8 **Assay**—Dissolve 0.15 g of the dried material obtained in Test No. 7 in 50 ml of water, add 3 g of potassium iodide and 10 ml of dilute hydrochloric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$.



Not less than 99.9 per cent should be indicated

ANALAR

POTASSIUM IODIDE

 $KI = 166.02$

Maximum Limits of Impurities

Free Alkali	0.2 ml N/1 per cent
Chloride and Bromide (Cl)	0.025 per cent
Iodate (IO_3)	0.0003 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Moisture	0.5 per cent

1 **Description.**—Colourless crystals

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Free Alkali.**—Dissolve 5 g in 50 ml of carbon dioxide-free water and add 0.2 ml of phenolphthalein solution. The solution should be colourless or should not require more than 0.1 ml of N/10 HCl to render it so.

4 **Chloride and Bromide.**—Dissolve 0.4 g in 5 ml of dilute ammonia solution, add 30 ml of N/10 $AgNO_3$ and 5 ml of water and shake well. Filter, and to the filtrate add 10 ml of dilute nitric acid. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

5 **Iodate.**—Dissolve 1 g in 20 ml of water and add 1 g of citric acid and 1 ml of starch solution. No blue colour should be produced.

6 **Sulphate.**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Heavy Metals and Iron.**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8 **Moisture.**—Dry 5 g of the finely powdered material at 120° for 1 hour. The loss in weight should not exceed 25 mg.

9 **Assay.**—Dissolve 0.5 g of the dried material, obtained in Test No. 8, in 25 ml of water, add 20 ml of dilute hydrochloric acid and 5 ml of potassium cyanide solution and titrate with M/20 KIO_3 until the dark brown solution which is formed becomes light brown, then add 5 ml of starch solution and continue the titration until the blue colour disappears.

1 ml M/20 $KIO_3 \equiv 0.0166$ g KI

Not less than 99.5 per cent should be indicated.

ANALAR

POTASSIUM METABISULPHITE



Maximum Limits of Impurities

Chloride (Cl)	0.02	per cent
Heavy Metals (Pb)	0.002	per cent
Iron (Fe)	0.001	per cent
Arsenic (As_2O_3)	0.00002	per cent
	(0.2 part per million)	

1. **Description.**—Colourless crystals or a white powder

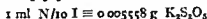
2. **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3. **Chloride.**—Dissolve 0.5 g in 5 ml of dilute nitric acid and warm until decomposition sets in. When the reaction has moderated, cool and add 45 ml of water and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" described in appendix 2.

4. **Heavy Metals and Iron.**—Dissolve 1 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

5. **Arsenic.**—To 5 g add 10 ml of water, 3 g of potassium chlorate and 20 ml of hydrochloric acid, when the reaction has ceased, boil gently to remove chlorine, add 40 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.001 mg standard stain.

6. **Assay.**—Dissolve 0.2 g in 50 ml of N/10 I and titrate the excess of iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$.



Not less than 96 per cent should be indicated.

ANALAR

POTASSIUM NITRATE



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Iodate (IO_3)	0.00005 per cent
Sulphate (SO_4)	0.005 per cent
Nitrite (NO_2)	0.0001 per cent
Phosphate (PO_4)	0.001 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

6 **Nitrite and Iodate**—Dissolve 1 g in 10 ml of water, add 1 ml of dilute sulphuric acid, 1 ml of starch solution and 1 ml of cadmium iodide solution and allow to stand for 1 minute. No blue colour should be produced.

7 **Phosphate**—Dissolve 1 g in 20 ml of water, add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the standard colour defined in appendix 2.

8 **Heavy Metals and Iron**—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

ANALAR POTASSIUM OXALATE



Maximum Limits of Impurities

Reaction	pH 7.0 to 8.0
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 40 ml of carbon dioxide free water should lie between the limits of pH 7.0 and 8.0 using phenol red as indicator.

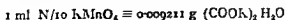
4 **Chloride**—Dissolve 2 g in 45 ml of warm water and add 5 ml of dilute nitric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Ignite 1 g under conditions that will not introduce sulphur. Dissolve the residue in 15 ml of hot water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 4 ml of dilute hydrochloric acid and filter. To the filtrate add 30 ml of water and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

8 **Assay**—Dissolve 0.3 g in 50 ml of hot water, add 5 ml of sulphuric acid and titrate with N/10 KMnO_4 at a temperature of about 60°.



Not less than 99 per cent should be indicated.

ANALAR POTASSIUM PERIODATE



Maximum Limits of Impurities

Chlorate Chloride Bromide (Cl)	0.01 per cent
Iodide (I)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Manganese (Mn)	0.0003 per cent
Moisture	0.1 per cent

1 **Description**—A white crystalline powder

2 **Solubility**—Very sparingly soluble in cold water. Dissolve 1 g in 50 ml of hot water; a clear colourless solution should be obtained.

3 **Chlorate, Chloride, Bromide**—Dissolve 1 g in 50 ml of water and 2 ml of nitric acid; add 0.1 g of sodium nitrite and 1 ml of silver nitrate solution and allow to stand for 5 minutes. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

4 **Iodide**—Dissolve 1 g in 40 ml of water and 10 ml of dilute sulphuric acid; shake vigorously with 0.5 ml of chloroform and allow to separate. The chloroform should not be coloured pink or violet.

5 **Manganese**—Boil 1 g with 25 ml of water and 10 ml of sulphuric acid and allow to stand for 5 minutes. No pink colour should be produced.

6 **Moisture**—Dry 5 g at 110° for 1 hour. The loss in weight should not exceed 5 mg.

7 **Assay**—Dissolve 0.5 g in 100 ml of water; add 3 g of sodium bicarbonate and 3 g of potassium iodide and titrate the liberated iodine with $\text{N}/10 \text{ Na}_2\text{AsO}_3$.



Not less than 99.7 per cent should be indicated.

ANALAR POTASSIUM PERMANGANATE



Maximum Limits of Impurities

Insoluble Matter	0.1 per cent
Chloride (Cl)	0.01 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.08 per cent

(Continued overleaf)

POTASSIUM PERMANGANATE—continued

1 **Description**—Black or dark purple crystals with a metallic lustre

2 **Solubility**.—Soluble in water forming a deep purple solution Dissolve 10 g in 200 ml of water filter through a Gooch crucible, wash with water dry and weigh Not more than 10 mg of residue should be obtained

3 **Chloride**.—Dissolve 1 g in 35 ml of water and add this solution slowly to a mixture of 10 ml of hydrogen peroxide (20 volumes) and 7 ml of dilute nitric acid, then add 1 ml of silver nitrate solution Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2

4 **Sulphate**.—Dissolve 1 g in 35 ml of water and add this solution slowly to a mixture of 10 ml of hydrogen peroxide (20 volumes) and 7 ml of dilute hydrochloric acid, then add 1 ml of barium chloride solution and allow to stand for 1 hour No turbidity or precipitate should be produced

5 **Nitrate**.—Dissolve 0.1 g in 10 ml of dilute sulphuric acid heat to 60° and add, in small portions at a time 0.5 g of oxalic acid Cool, add 4 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling The blue colour should not entirely disappear

6 **Assay**.—Dissolve 0.1 g in 50 ml of water add 3 g of potassium iodide and 10 ml of dilute sulphuric acid and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$

$$1 \text{ ml } N/10 \text{ Na}_2\text{S}_2\text{O}_3 = 0.00316 \text{ g } \text{KMnO}_4$$

Not less than 99.5 per cent should be indicated

ANALAR**POTASSIUM PERSULPHATE****Maximum Limits of Impurities**

Chloride (Cl)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Manganese (Mn)	0.0002 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
(1 part per million)	

1 **Description**.—A white crystalline powder

2 **Solubility**.—Dissolve 5 g in 50 ml of hot water A clear colourless solution should be produced

3 **Chloride**.—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 0.2 ml of silver nitrate solution Any opalescence

produced should not be greater than the "standard opalescence" defined in appendix 2

4 Heavy Metals and Iron.—Boil 1 g with 10 ml of dilute hydrochloric acid until reduced to 5 ml., cool, add 30 ml of water and 15 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

5 Manganese.—Dissolve 2 g in a mixture of 10 ml of dilute sulphuric acid, 10 ml of dilute ammonia solution 3 ml. of dilute nitric acid and 1 ml of silver nitrate solution previously heated to 90°, keep at that temperature for 1 minute and then cool rapidly. No pink colour should be produced

6 Ammonia.—Dissolve 1 g in 50 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

7 Arsenic.—Mix 5 g with 15 ml of hydrochloric acid and boil gently to remove free chlorine, dilute with 50 ml of water, add a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

8 Assay.—Dissolve 0.5 g of the finely powdered material in a solution of 0.5 g of ferrous sulphate, 3 g of potassium iodide, 25 ml of dilute sulphuric acid and 25 ml of water, allow to stand for 30 minutes and titrate the liberated iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$. Carry out a blank titration without the persulphate and make the necessary correction

$$1 \text{ ml N/10 } \text{Na}_2\text{S}_2\text{O}_3 \equiv 0.01352 \text{ g } \text{K}_2\text{S}_2\text{O}_8$$

Not less than 98 per cent should be indicated

ANALAR POTASSIUM SULPHATE



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.005 per cent
Magnesium (Mg)	0.01 per cent
Ammonia (NH_3)	0.001 per cent

(Continued overleaf)

POTASSIUM SULPHATE—*cont. next*

1 **Description.**—Colourless crystals

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction.**—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Chloride.**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Nitrate.**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Heavy Metals and Iron.**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

7 **Calcium.**—Dissolve 2 g in 40 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

8 **Magnesium.**—Dissolve 2 g in 40 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium phosphate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

9 **Ammonia.**—Dissolve 1 g in 50 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

ANALAR**POTASSIUM TETROXALATE****Maximum Limits of Impurities**

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Calcium (Ca)	0.005 per cent

1 **Description.**—Colourless crystals

2 **Solubility.**—Dissolve 5 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Chloride**—Dissolve 1 g in 45 ml of warm water and add 5 ml of dilute nitric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate**—Ignite 1 g under conditions that will not introduce sulphur. Dissolve the residue in 15 ml of hot water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 4 ml of dilute hydrochloric acid and filter. To the filtrate add 30 ml of water and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Nitrate**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

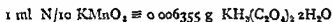
7 **Calcium**—Dissolve 1 g in 20 ml of water, add 5 ml of dilute ammonia solution and allow to stand for 4 hours. No turbidity or precipitate should be produced.

8 **Assay**—(a) Dissolve 4 g in 50 ml of hot water and titrate with N/1 NaOH using phenolphthalein as indicator.



Not less than 99.9 per cent should be indicated.

(b) Dissolve 0.3 g in 50 ml of hot water, add 5 ml of sulphuric acid and titrate with N/10 KMnO_4 at a temperature of about 60° .



Not less than 99.9 per cent should be indicated.

ANALAR POTASSIUM THIOCYANATE

$\text{KSCN} = 97.18$

Maximum Limits of Impurities

Reaction	not over pH 7.0
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0001 per cent
Ammonia	no reaction
Other Sulphur Compounds (S)	0.001 per cent

(Continued overleaf)

POTASSIUM THIOCYANATE—continued

1 **Description.**—Colourless deliquescent crystals.

2 **Solubility.**—Dissolve 5 g in 50 ml of water, a clear colourless solution should be produced. Five grams dissolve completely in 50 ml of hot 90 per cent alcohol.

3. **Reaction.**—Dissolve 1 g in 10 ml of carbon dioxide-free water. The solution should not be alkaline to bromothymol blue.

4 **Chloride.**—Dissolve 1 g with 1 g of ammonium nitrate in 30 ml of hydrogen peroxide (20 volumes), add 1 g of sodium hydroxide, warm gently and rotate the flask until a vigorous reaction commences. When this has abated, add a further 30 ml of hydrogen peroxide and boil for 2 minutes, cool and add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not exceed that given by 0.5 ml of standard chloride solution (1 ml = 0.1 mg Cl) in an equal volume of solution containing the quantities of reagents used in the test.

5 **Sulphate.**—Dissolve 5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals.**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Iron.**—Dissolve 6 g in 30 ml of water, add 1 ml of dilute hydrochloric acid and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 g dissolved in 5 ml of water with 1 ml of dilute hydrochloric acid, 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) and 10 ml of the mixture of amyl alcohol and amyl acetate in the same manner.

8 **Ammonia.**—Boil 1 g with 5 ml of sodium hydroxide solution. No odour of ammonia should be perceptible.

9 **Other Sulphur Compounds.**—Dissolve 5 g in 25 ml of water, add a mixture of 20 ml of dilute ammonia solution and 4 ml of silver nitrate solution and warm on a water bath for 15 minutes. Any brown colour produced should not be greater than that given by adding a few drops of sodium sulphide solution to a mixture of 30 ml of water, 20 ml of dilute ammonia solution and 3 ml of N/1000 AgNO₃, and warming on a water-bath for 15 minutes.

10 **Assay.**—Dissolve 0.4 g in 50 ml of water, add 5 ml of dilute nitric acid and 50 ml of N/10 AgNO₃ and titrate the excess silver with N/10 NH₄SCN using ferric ammonium sulphate as indicator.

1 ml N/10 AgNO₃ ≡ 0.009718 g KSCN

Not less than 98 per cent should be indicated.

ANALAR

150-PROPYL ALCOHOL



Maximum Limits of Impurities

Water-insoluble Matter	nil
Acidity	0.01 ml N/1 per cent
Alkalinity	0.01 ml N/1 per cent
Non-volatile Matter	0.005 per cent
Aldehydes and Ketones $((\text{CH}_2)_3\text{CO})$	0.03 per cent
Oxygen absorbed (O)	0.0004 per cent
Water	0.25 per cent

- 1 **Description**—A clear colourless liquid with a characteristic odour
- 2 **Solubility**.—Miscible in all proportions with water forming clear colourless solutions
- 3 **Reaction**—Mix 10 ml with 10 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.1 ml of N/100 HCl or N/100 NaOH to render it so
- 4 **Specific Gravity** (15.5°/15.5°)—0.789 to 0.791
- 5 **Refractive Index**— n_D^{20} 1.3750 to 1.3780
- 6 **Boiling Range**—Not less than 95 per cent should distil between 81.5° and 82.5°
- 7 **Non-volatile Matter**.—Evaporate 25 ml to dryness on a water-bath. Not more than 1 mg of residue should be left
- 8 **Aldehydes and Ketones**.—Mix in a stoppered cylinder 25 ml with 25 ml of water and 50 ml of hydroxylamine hydrochloride reagent, allow to stand for 5 minutes and titrate with N/10 NaOH to the same green colour as shown by 50 ml of the reagent contained in a similar cylinder, both being viewed down the axes of the cylinders. Not more than 1.0 ml of N/10 NaOH should be required
- 9 **Oxygen Absorbed**.—To 10 ml add 0.05 ml of N/10 KMnO_4 . The pink colour should persist for 10 minutes
- 10 **Water**.—Titrate 20 ml of methyl alcohol, electrometrically, with Karl Fischer reagent, then add 20 g of the sample and again titrate with Karl Fischer reagent until a small excess is present and a permanent iodine colour has been established. Immediately back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used after the addition of the sample should be equivalent to not more than 50 mg of water

ANALAR PYRIDINE

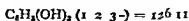


Maximum Limits of Impurities

Non-volatile Matter	0.01 per cent
Chloride (Cl)	0.0005 per cent
Copper (Cu)	0.0004 per cent
Ammonia	no reaction
Oxygen absorbed (O)	0.0006 per cent
Water	0.25 per cent.

- 1 **Description.**—A clear colourless liquid with a characteristic odour
- 2 **Solubility.**—Miscible in all proportions with water forming clear colourless solutions
- 3 **Weight per ml. at 20°.**—0.980 to 0.983 g
- 4 **Refractive Index.**— n_D^{20} 1.5070 to 1.5090
- 5 **Boiling Range.**—Not less than 95 per cent should distil between 114° and 117°
- 6 **Non-volatile Matter.**—Evaporate 10 ml to dryness and ignite gently. Not more than 1 mg of residue should be left
- 7 **Chloride.**—Dissolve 2 ml in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced
- 8 **Copper.**—Dissolve 5 ml in 10 ml of water and 5 ml of dilute acetic acid, add 5 ml of ammonium thiocyanate solution and 5 ml of chloroform, shake vigorously and allow to separate. The chloroform layer should not be coloured yellow or green
9. **Ammonia.**—Dissolve 2 ml in 10 ml of carbon dioxide free water and add 0.1 ml of phenolphthalein solution. No pink colour should be produced
- 10 **Oxygen Absorption.**—Mix 5 ml with 0.05 ml of N/10 KMnO_4 and allow to stand for 1 hour. The pink colour should not entirely disappear
11. **Water.**—Titrate 40 g slowly with Karl Fischer reagent until a small excess is present and a permanent iodine colour is established. Back titrate this excess, electrometrically, with a standard solution of water in methyl alcohol. The volume of Karl Fischer reagent used should be equivalent to not more than 100 mg of water
- 12 **Assay.**—Dissolve 3 g in 20 ml of water and titrate electrometrically with N/1 HCl to pH 2.8
 $1 \text{ ml N/1 HCl} \equiv 0.07910 \text{ g C}_5\text{H}_5\text{N}$
 Not less than 99 per cent should be indicated

ANALAR PYROGALLOL



Maximum Limit of Impurity

Sulphated Ash

0.05 per cent

1 **Description.**—Light white crystalline powder or dense white crystals

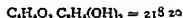
2 **Solubility.**—Very soluble in water and in alcohol. A solution of 1 g in 20 ml of freshly boiled and cooled water is at first almost colourless but slowly becomes brown on exposure to air

3 **Reaction.**—The solution obtained in the above test should be neutral to methyl orange

4 **Melting Point.**—132° to 134°

5 **Sulphated Ash.**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

ANALAR QUINHYDRONE



Maximum Limits of Impurities

Alcohol-insoluble Matter

nil

Sulphated Ash

0.1 per cent

1. **Description.**—A lustrous dark green crystalline powder

2 **Solubility.**—Slightly soluble in water. Dissolve 1 g in 50 ml of 90 per cent ethyl alcohol, a clear orange-brown solution should be produced.

3 **Melting Point.**—170° to 172°

4 **Sulphated Ash.**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left

5 **Assay.**—(a) Quinone.—Dissolve 0.4 g in 10 ml of warm alcohol, cool, add a cold solution of 2 g of potassium iodide in 40 ml of dilute hydrochloric acid and titrate at once with N/10 $\text{Na}_2\text{S}_2\text{O}_3$, using starch solution as indicator

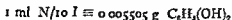


Not less than 49.2 per cent. and not more than 49.7 per cent. should be indicated

(Continued overleaf)

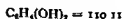
QUINHYDRONE—continued

(b) Quinol—Dissolve 4 g of sodium bicarbonate in 300 ml of water, add 0.4 g of the quinhydrone and shake until most is dissolved. Add 50 ml of N/10 iodine solution, shake until the quinhydrone is completely dissolved and titrate after 5 minutes with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch solution as indicator.



Not less than 50.2 per cent and not more than 50.7 per cent should be indicated.

ANALAR RESORCINOL



Maximum Limits of Impurities

Acidity	passes test
Sulphated Ash	0.01 per cent
Diresorcinol and Phenol	no reaction

1 **Description**—A colourless crystalline powder becoming pink on exposure to air and light.

2 **Solubility**—Very soluble in alcohol. Dissolve 1 g in 50 ml of water; a clear colourless solution should be produced.

3 **Melting Point**— 110° to 112° .

4 **Acidity**—Dissolve 1 g in 10 ml of carbon dioxide free water, add 0.05 ml of N/10 NaOH and 0.1 ml of bromocresol green solution. A blue colour should be produced.

5 **Sulphated Ash**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left.

6 **Diresorcinol and Phenol**—Dissolve 1 g in 10 ml of water. A clear solution should be produced and on warming no phenolic odour should be perceptible.

ANALAR SALICYLALDOXIME



Maximum Limit of Impurity

Sulphated Ash	0.05 per cent
Sensitivity to Copper (Cu)	1 : 2 000 000 minimum

1 **Description**—White or cream coloured crystals or powder.

2 **Solubility**—Soluble in ether benzene and dilute hydrochloric acid. Dissolve 1 g in 5 ml of alcohol and 45 ml of water. A clear colourless solution should be produced.

3 **Melting Point**—56° to 58°

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Sensitivity to Copper**—Add 1 ml of a 1 per cent solution in 5 per cent aqueous alcohol to a mixture of 1 ml of standard copper solution (1 ml = 0.01 mg Cu) 19 ml of water and 2 drops of dilute acetic acid. A turbidity should be produced within 5 minutes.

ANALAR SALICYLIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.02 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0001 per cent
Organic Impurities	passes test

1 **Description**—Small colourless crystals.

2 **Solubility**—Readily soluble in alcohol. Dissolve 1 g in 50 ml of hot water. A clear colourless solution should be produced.

3 **Melting Point**—158° to 159°

4 **Sulphated Ash**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride**—Dissolve 3 g in 90 ml of hot water. Cool and filter, to 30 ml of the filtrate add 20 ml of water, 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

6 **Sulphate**—To a further 30 ml of the filtrate from Test No. 5 add 20 ml of water, 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

7 **Heavy Metals**—Dissolve 5 g in 40 ml of water and 10 ml of dilute ammonia solution, the solution should not be more than slightly coloured and on passing hydrogen sulphide through the solution for a few seconds any increase in the colour should not be deeper than the standard colours defined in appendix 2.

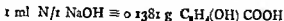
(Continued overleaf)

SALICYLIC ACID—continued

8 **Iron**—Dissolve 5 g in 50 ml of alcohol and add 1 drop of hydrogen peroxide (20 volumes) and 1 drop of dilute ammonia solution. No violet colour should be produced.

9 **Organic Impurities**—Dissolve 0.5 g in 10 ml of sulphuric acid. The colour of the solution should not be deeper than pale yellow.

10 **Assay**—Dissolve 5 g in 20 ml of alcohol and titrate with N/1 NaOH using phenol red as indicator.



Not less than 99.9 per cent should be indicated.

ANALAR SELENIUM

Se = 78.96

Maximum Limits of Impurities

Ash	0.1 per cent
Sulphur (S)	0.003 per cent
Tellurium (Te)	0.1 per cent
Nitrogen (N)	0.02 per cent
Moisture	0.1 per cent

1 **Description**—Very dark red to black powder or solid.

2 **Solubility**—Dissolve 1 g in 5 ml of nitric acid and dilute to 50 ml with water. A clear and almost colourless solution should be obtained.

3 **Melting Point**—216° to 222°.

4 **Ash**—Ignite 2 g gently. Not more than 2 mg of residue should be left.

5 **Sulphur**—Dissolve 1 g in 5 ml of nitric acid and evaporate on a water-bath to dryness, dissolve the residue in 50 ml of hot water, add 5 ml of 50 per cent w/w hydrazine hydrate solution and 5 ml of dilute hydrochloric acid, boil to precipitate the selenium, filter, evaporate the filtrate to about 40 ml, cool, make up to 50 ml and add 1 ml of barium chloride solution. No turbidity or precipitate should be produced.

6 **Tellurium**—Dissolve 0.5 g in 2.5 ml of nitric acid and evaporate to dryness on a water bath, dissolve the residue in 50 ml of hydrochloric acid, pass in sulphur dioxide for half an hour and allow to stand for twenty-four hours, filter, evaporate the filtrate to 10 ml on a water-bath, add 10 ml of saturated sulphur dioxide solution and 5 ml of 50 per cent w/w hydrazine hydrate solution and boil. Any tellurium present will precipitate as a black powder. Filter on a weighed sintered glass crucible, wash with hot water, then with alcohol and dry at 100°. Not more than 0.5 mg of residue should be obtained.

7 Nitrogen.—Digest 1 g with 20 ml of sulphuric acid, 0.1 g of sucrose, and 5 g of potassium sulphate until complete oxidation has taken place. Cool, dilute with water, and add 150 ml of a previously boiled solution containing 30 g of sodium hydroxide. Distil, and collect the distillate in 10 ml N/100 H_2SO_4 and titrate the excess of acid with N/100 NaOH using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 1.4 ml.

8 Moisture.—Dry 5 g at 110° for 1 hour. The loss in weight should not exceed 5 mg.

9 Assay.—To 0.3 g add 5 ml of hydrochloric acid and 1 ml of nitric acid and heat under reflux to dissolve. Cool, dilute to 100 ml with water, add strong ammonia solution until alkaline, neutralise with dilute hydrochloric acid and add 5 ml in excess. Add 2 g of hydrazine sulphate and heat gently under reflux until the precipitate coagulates and becomes entirely black. Filter through a sintered glass crucible No. 4, wash with hot water until free from chloride and finally with a little alcohol. Dry at $105^\circ C$ and weigh the selenium.

Not less than 99 per cent should be indicated.

ANALAR SEMICARBAZIDE HYDROCHLORIDE



Maximum Limits of Impurities

Sulphated Ash	0.1 per cent
Hydrazine ($NH_2 \cdot NH_2$)	0.5 per cent

1 Description.—A white crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained.

3 Melting Point.— 173° to 178° with decomposition.

4 Sulphated Ash.—Moisten 5 g with sulphuric acid and ignite gently. Not more than 5 mg of residue should be left.

5 Hydrazine.—Dissolve 0.2 g in 100 ml of water and to 5 ml of this solution add 1 ml of a solution of 0.4 g of *p*-dimethylaminobenzaldehyde in 20 ml of alcohol and 2 ml of hydrochloric acid. Allow to stand for 15 minutes. The solution should show no orange tint when compared with a blank from which the semicarbazide hydrochloride is omitted.

6 Assay.—Dissolve 0.2 g in 10 ml of water and 30 ml of hydrochloric acid in a stoppered bottle, add 2 ml of chloroform and titrate with

(Continued overleaf)

SEMICARBAZIDE HYDROCHLORIDE—*cont. mixed*

M/20 KIO_3 with vigorous shaking until the colour is discharged from the chloroform globule

1 ml M/20 $\text{KIO}_3 = 0.005577 \text{ g } \text{NH}_2\text{NHCO}\text{NH}_2\text{HCl}$

Not less than 99 per cent should be indicated

ANALAR SILVER NITRATE

$\text{AgNO}_3 = 169.89$

Maximum Limits of Impurities

Alcohol insoluble Matter	n l
Chloride (Cl)	0.0002 per cent
Sulphate (SO_4)	0.005 per cent
Copper	no reaction
Bismuth	no reaction
Lead	no reaction
Alkalis and other Metals	0.05 per cent

1 **Description**—Colourless crystalline plates

2 **Solubility**.—Dissolve 5 g in 50 ml of water a clear colourless solution should be produced. Dissolve 0.5 g in 0.5 ml of water and add 20 ml of ethyl alcohol (99–100 per cent) a clear colourless solution should be produced

3 **Chloride**—To the aqueous solution from Test No. 2 add 1 ml of dilute nitric acid. No opalescence should be produced

4 **Sulphate**—Dissolve 2 g in 50 ml of water add 1 ml of dilute nitric acid and 1 ml of barium nitrate solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Copper, Bismuth and Lead**—To the solution from Test No. 3 add 10 ml of dilute ammonia solution. A clear colourless solution should be produced

6 **Alkalis and other Metals**—Dissolve 2 g in 50 ml of water add 3 ml of dilute hydrochloric acid filter evaporate the filtrate to dryness and ignite gently in porcelain or silica. Not more than 1 mg of residue should be obtained

7 **Assay**—Dissolve 1 g in 150 ml of water heat to boiling add slowly with constant stirring 2 ml of dilute hydrochloric acid boil gently for 5 minutes and set aside in the dark to cool. Filter through a Gooch crucible wash dry at 130° and weigh the resulting silver chloride

Weight of $\text{AgCl} \times 1.183 = \text{weight of } \text{AgNO}_3$

Not less than 99.9 per cent should be indicated

ANALAR SILVER SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.001 per cent
Copper .	no reaction
Bismuth .	no reaction
Lead .	no reaction
Iron (Fe)	0.001 per cent
Alkalis and other Metals (as sulphates)	0.2 per cent

1. Description.—White crystalline powder, darkening on exposure to light

2 Chloride—Dissolve 1 g by boiling with 45 ml of water and 5 ml of dilute nitric acid. No residue or opalescence should remain

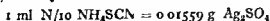
3 Nitrate.—Suspend 1 g in 5 ml of water, add 0.5 ml of standard indigo solution and 5 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear

4 Copper, Bismuth, and Lead.—Shake 2 g with 10 ml of dilute ammonia solution. A clear colourless solution should be produced

5 Iron.—Dissolve the residue from Test No. 6 by heating with 2 ml of hydrochloric acid, dilute with 10 ml of water and add 1 drop of $\text{N}/10 \text{KMnO}_4$, mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

6 Alkalis and other Metals.—Dissolve 1 g in 50 ml of water and 5 ml of dilute nitric acid, heat to boiling, add slowly with stirring 2 ml of dilute hydrochloric acid, filter, evaporate the filtrate to dryness in porcelain or silica and ignite. Not more than 2 mg should be obtained

7 Assay.—Dissolve 0.5 g in 15 ml of dilute nitric acid, dilute to about 50 ml with water, add 0.5 g of ferric ammonium sulphate and titrate with $\text{N}/10 \text{NH}_4\text{SCN}$



Not less than 99 per cent should be indicated

ANALAR SODIUM ACETATE (ANHYDROUS)

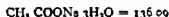


Maximum Limits of Impurities

Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.01 per cent

- 1 **Description.**—Pale grey crystalline masses
- 2 **Solubility.**—Dissolve 5 g in 50 ml of water. The solution should show not more than a slight brown colour or turbidity.
- 3 4 **Tests for Chloride and Sulphate** are carried out as described for Sodium Acetate (Hydrated) using in each test one half the specified quantity of the sample.
- 5 **Assay.**—Moisten 1 g with sulphuric acid, ignite and weigh the resulting Na_2SO_4 .
 $\text{Weight of Na}_2\text{SO}_4 \times 1.155 = \text{weight of CH}_3\text{COONa}$
 Not less than 98 per cent should be indicated.

ANALAR SODIUM ACETATE (HYDRATED)



Maximum Limits of Impurities

Reaction	passes test
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.01 per cent
Oxygen absorbed (O)	0.004 per cent

- 1 **Description.**—Colourless crystals.
- 2 **Solubility.**—Readily soluble in alcohol. Dissolve 5 g in 50 ml of water, a clear colourless solution should be produced.
- 3 **Reaction.**—Dissolve 1 g in 10 ml of carbon dioxide free water and add 0.1 ml of thymolphthalein solution. There should be no change in colour and on the further addition of 0.1 ml of phenolphthalein solution a pink colour should be produced.
- 4 **Chloride.**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 Sulphate.—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 Heavy Metals and Iron.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

7 Calcium.—Dissolve 1 g in 20 ml of water and add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution. No turbidity or precipitate should be produced.

8 Oxygen Absorption.—Dissolve 1 g in 100 ml of boiling water, add 0.05 ml of N/10 KMnO_4 and boil for 5 minutes. The pink colour should not entirely disappear.

ANALAR SODIUM ARSENATE



Maximum Limits of Impurities

Reaction	pH 8.8–9.0
Carbonate	passes test
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Arsenite (As_2O_3)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Loss on drying	38 to 41 per cent

1 Description.—White crystals or crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained.

3 Reaction.—The reaction of a solution of 1 g in 50 ml of carbon dioxide-free water should lie between the limits of pH 8.8 and 9.0 using thymol blue as indicator.

4 Carbonate.—Dissolve 5 g in 50 ml of boiling water and to the hot solution add 10 ml of dilute hydrochloric acid. No effervescence should be produced.

5 Chloride.—Dissolve 1 g in 50 ml of water and add 2 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

6 Sulphate.—Dissolve 1 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

(Continued overleaf)

SODIUM ARSENATE—continued

7 **Nitrate**.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

8 **Arsenite**.—Dissolve 10 g in 50 ml of water, add 7 ml of dilute sulphuric acid and 5 g of sodium bicarbonate and titrate with N/10 I using starch solution as indicator. Not more than 0.1 ml of N/10 I should be required.

9 **Heavy Metals and Iron**.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

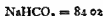
10 **Loss on Drying**.—Dry 0.5 g at 150° for one hour. The loss in weight should not be greater than 0.205 g and should not be less than 0.190 g.

11 **Assay**.—Dissolve the dried material obtained in Test No. 10 in 3 ml of dilute hydrochloric acid and 12 ml of water, warm on a water-bath for 5 minutes, add 4 g of potassium iodide, warm on a water-bath for a further 10 minutes and cool. Remove the iodine by titration with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch as indicator, add 5 g of sodium bicarbonate and titrate with N/10 iodine.



Not less than 99 per cent and not more than 100.5 per cent. should be indicated.

ANALAR SODIUM BICARBONATE



Maximum Limits of Impurities

Carbonate (Na_2CO_3)	1.0	per cent
Chloride (Cl)	0.005	per cent
Sulphate (SO_4)	0.005	per cent
Nitrate (NO_3)	0.002	per cent
Phosphate (PO_4)	0.001	per cent
Silicate (SiO_2)	0.005	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent
Calcium, Magnesium and Insoluble Matter	0.01	per cent
Ammonia (NH_3)	0.0005	per cent
Iodine absorbed (I)	0.006	per cent
Arsenic (As_2O_3)	0.0001	per cent
	(1 part per million)	

1 **Description**.—A soft white crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3 **Carbonate**—The reaction of a solution of 1 g in 100 ml of carbon dioxide free water should not be greater than pH 8.5, using thymol blue as indicator.

4 **Chloride**—Dissolve 2 g in 45 ml of water and add 6 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

5 **Sulphate**—Dissolve 5 g in 100 ml of water, add 15 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

6 **Nitrate**—Dissolve 1 g in 10 ml of dilute sulphuric acid, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 **Phosphate**—Dissolve 2 g in 10 ml of water in a platinum dish and neutralise with dilute sulphuric acid (about 4 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder of the solution for Test No 8) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2.

8 **Silicate**—To 2 ml of the solution retained from Test No 7 add 20 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2.

9 **Heavy Metals and Iron**—Dissolve 2 g in 5 ml of dilute hydrochloric acid, add 40 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

10 **Calcium, Magnesium and Insoluble Matter**—Boil 10 g for 5 minutes with 50 ml of water and 25 ml of dilute ammonia solution, filter, wash, dry, ignite and weigh the residue. Not more than 1 mg should be obtained.

11 **Ammonia**—Dissolve 2 g in 50 ml of water, add 2.5 ml of hydrochloric acid, boil to remove carbon dioxide, cool and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not be greater than that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

12 **Iodine Absorption**—Dissolve 10 g in 200 ml of freshly boiled and cooled water and add 2 ml of starch solution and 0.05 ml of

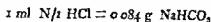
(Continued overleaf)

SODIUM BICARBONATE—*continued*

N/10 I A blue colour, which does not disappear within 1 hour should be produced

13 Arsenic.—Dissolve 5 g in 16 ml of brominated hydrochloric acid and 45 ml of water add a few drops of *stannous chloride solution* and test as described in appendix 4 Any stain produced should not be greater than a 0.005 mg standard stain

14 Assay—Dissolve 4 g in 50 ml of water, and titrate with **N/1 HCl** using bromophenol blue as indicator



Not less than 99.5 per cent should be indicated

ANALAR SODIUM BISMUTHATE



Maximum Limits of Impurities

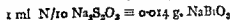
Chloride (Cl)	0.005 per cent
Manganese (Mn)	0.0005 per cent

1 Description—A yellow or brown amorphous powder

2 Chloride—Treat 2 g with 15 ml of water 10 ml of dilute nitric acid and 5 ml of hydrogen peroxide (20 volumes) When the reaction has ceased filter if necessary and to the filtrate add 20 ml of water and 1 ml of silver nitrate solution Any opalescence produced should not be greater than the standard opalescence defined in appendix 2

3 Manganese—Boil gently 2 g with 15 ml of nitric acid and 35 ml of water until dissolved Cool add a further 0.5 g of the sample, shake occasionally during 5 minutes and allow to stand until clear or filter through asbestos or sintered glass Any pink colour produced should not be greater than that given by 50 ml of water containing 0.1 ml of **N/100 KMnO₄**

4 Assay—Treat 0.5 g with 10 ml of water 5 g of potassium iodide and 40 ml of dilute hydrochloric acid Allow to stand for 30 minutes add starch solution (since the solution remains a deep yellow colour throughout the titration it is desirable to add the indicator at this stage) and titrate the liberated iodine with **N/10 Na₂S₂O₃**



Not less than 85 per cent should be indicated

ANALAR

SODIUM BISULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.0005 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Ammonia (NH_3)	0.001 per cent.
Arsenic (As_2O_3)	0.0001 per cent (1 part per million)

1 **Description**.—Opaque white masses

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride**.—Dissolve 2 g in 50 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Nitrate**.—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

5 **Heavy Metals and Iron**.—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

6 **Ammonia**.—Dissolve 1 g in 50 ml of water and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

7. **Arsenic**.—Dissolve 10 g in 50 ml of water, add 5 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

8 **Assay**.—Dissolve 5 g in 50 ml of water and titrate with N/1 NaOH using methyl red as indicator.



Not less than 99 per cent and not more than 102 per cent, should be indicated.

ANALAR

SODIUM BORATE

(Borax)



Maximum Limits of Impurities

Carbonate	no reaction
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.01 per cent
Arsenic (As_2O_3)	0.0005 per cent
	(5 parts per million)

1 Description—Transparent crystals or a white crystalline powder

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Carbonate—Dissolve 1 g in 10 ml of warm water and add 2 ml of dilute hydrochloric acid. No effervescence should be produced.

4 Chloride—Dissolve 2 g in 50 ml of warm water and add 3 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

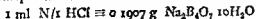
5 Sulphate—Dissolve 2 g in 50 ml of warm water, add 3 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 Heavy Metals and Iron—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 Calcium—Dissolve 2 g in 25 ml of hot water, add 3 ml of dilute acetic acid and 5 ml of ammonium oxalate solution and allow to stand for 10 minutes. No turbidity or precipitate should be produced.

8 Arsenic—Dissolve 2 g, with 4 g of citric acid, in 50 ml of hot water, add 12 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

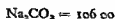
9 Assay—Dissolve 7 g in 100 ml of water and titrate with N/1 HCl using bromophenol blue as indicator.



Not less than 99 per cent and not more than 101 per cent should be indicated.

ANALAR

SODIUM CARBONATE (ANHYDROUS)



Maximum Limits of Impurities

Chloride (Cl)	0.003	per cent
Sulphate (SO_4)	0.005	per cent
Nitrate (NO_3)	0.002	per cent
Phosphate (PO_4)	0.001	per cent
Silicate (SiO_2)	0.005	per cent
Heavy Metals (Pb)	0.002	per cent
Iron (Fe)	0.001	per cent
Ammonia (NH_3)	0.0002	per cent
Iodine absorbed (I)	0.012	per cent
Arsenic (As_2O_3)	0.00004	per cent.
	(0.4 part per million)	
Moisture	1.0	per cent

1 **Description**—A white powder

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride**—Dissolve 3 g in 40 ml of water and add 12 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.

4 **Sulphate**—Dissolve 5 g in 100 ml of water, add 25 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Nitrate**—Dissolve 1 g in 10 ml of dilute sulphuric acid, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Phosphate**—Dissolve 2 g in 20 ml of water in a platinum dish and neutralise with dilute sulphuric acid (about 6 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder for Test No. 7) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the standard colour defined in appendix 2.

7 **Silicate**—To 2 ml of the solution retained from Test No. 6 add 20 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the standard colour defined in appendix 2.

(Continued overleaf)

SODIUM CARBONATE (ANHYDROUS)—continued

8 Heavy Metals and Iron—Dissolve 1 g in 5 ml of dilute hydrochloric acid add 40 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2

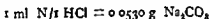
9 Ammonia—Dissolve 5 g in 40 ml of water, add 9 ml of hydrochloric acid, boil to remove carbon dioxide cool and add 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not be greater than that given by the addition of 2 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

10 Iodine Absorption—Dissolve 5 g in 100 ml of freshly boiled and cooled water and add 2 ml of starch solution, 0.05 ml of N/10 I and 20 ml of dilute hydrochloric acid. A blue colour should be produced

11 Arsenic—Dissolve 5 g in 50 ml of water, add 18 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg standard stain

12 Moisture—Dry 2.5 g at about 300° for 15 minutes. The loss in weight should not exceed 25 mg

13 Assay—Dissolve the dried material obtained in Test No. 12 in 50 ml of water and titrate with N/1 HCl using bromophenol blue as indicator



Not less than 99.9 per cent should be indicated

ANALAR**SODIUM CARBONATE (HYDRATED)****Maximum Limits of Impurities**

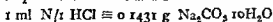
Chloride (Cl)	0.0015	per cent
Sulphate (SO_4)	0.0025	per cent
Nitrate (NO_3)	0.001	per cent
Phosphate (PO_4)	0.0005	per cent
Silicate (SiO_2)	0.0025	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent
Ammonia (NH_3)	0.0001	per cent
Iodine absorbed (I)	0.006	per cent
Arsenic (As_2O_3)	0.00002	per cent
	(0.2 part per million)	

1 Description—Colourless crystals free from efflorescence

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3-11 Other Tests—These tests should be carried out as described under Sodium Carbonate (Anhydrous) Tests Nos 3 to 11 using in each test double the specified amount of the sample.

12 Assay—Dissolve 5 g in 50 ml of water and titrate with N/1 HCl using bromophenol blue as indicator.



Not less than 99 per cent and not more than 102 per cent should be indicated.

ANALAR SODIUM CHLORIDE



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Sulphate (SO_4)	0.003 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium (Ba)	0.003 per cent
Calcium (Ca)	0.005 per cent
Magnesium (Mg)	0.005 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 Description—Small white crystals or a crystalline powder.

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Reaction—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 Sulphate—Dissolve 5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 24 hours. No turbidity or precipitate should be produced.

5 Nitrate—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Heavy Metals and Iron—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the

(Continued overleaf)

SODIUM CHLORIDE—*continued*

solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7. **Barium**.—Dissolve 5 g in 50 ml of water, add 1 ml of dilute sulphuric acid and allow to stand for 2 hours. No turbidity or precipitate should be produced.

8. **Calcium**.—Dissolve 2 g in 20 ml of water, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

9. **Magnesium**.—Dissolve 2 g in 10 ml of water, add 5 ml of dilute ammonia solution and 5 ml of ammonium phosphate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

10. **Ammonia**.—Dissolve 1 g in 50 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

11. **Arsenic**.—Dissolve 5 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

12. **Assay**.—Dissolve 0.5 g of freshly ignited material in 150 ml of water, acidify with 5 ml of dilute nitric acid and add silver nitrate solution slowly with stirring until present in slight excess (about 35 ml is required). Heat to boiling, allow to cool in the dark, filter through asbestos in a Gooch crucible, wash first with water containing a little nitric acid then with water, dry at 130° and weigh.

Weight of $\text{AgCl} \times 0.4078 = \text{weight of NaCl}$

Not less than 99.9 per cent should be indicated.

ANALAR**SODIUM CITRATE****Maximum Limits of Impurities**

Free Acid	1.0 ml N/1 per cent
Free Alkali	1.0 ml N/1 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Reducing Substances	passes test
Organic Impurities	passes test

1. **Description**.—Small white crystals or a crystalline powder.

2. **Solubility**.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction.**—Boil 5 g with 50 ml of water and cool. The solution should be neutral to thymol blue or should not require more than 0.5 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Chloride.**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

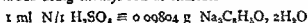
5 **Sulphate.**—Dissolve 1 g in 50 ml of water, add 3 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron.**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Reducing Substances.**—Dissolve 10 g in 50 ml of hot water, add 4 g of anhydrous sodium carbonate and 10 ml of cupric sulphate solution and boil for 5 minutes. No turbidity or precipitate should be produced.

8 **Organic Impurities.**—Heat 2 g with 10 ml of sulphuric acid in a boiling water-bath for 1 hour. Not more than a pale yellow colour should be produced.

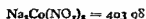
9 **Assay.**—Ignite gently 4 g in a platinum dish until decomposition is complete. Boil the residue with 100 ml of water and 50 ml of N/1 H_2SO_4 , filter and wash with water. Titrate the filtrate and washings with N/1 NaOH using methyl red as indicator.



Not less than 99 per cent should be indicated.

ANALAR

SODIUM COBALTINITRITE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Iron (Fe)	0.002 per cent
Potassium (K)	0.01 per cent

Sensitivity to Potassium (K) 1 in 10,000 minimum

1. **Description.**—An orange-yellow powder.

2. **Solubility.**—Dissolve 2 g in 50 ml of water. A clear orange-red solution should be produced.

(Continued overleaf)

SODIUM COBALTINITRITE—continued

3 **Chloride.**—Dissolve 4 g in 60 ml of water, add 5 ml of nitric acid and 40 ml of hydrogen peroxide (20 volumes) and warm on a water-bath until decomposition is complete. Cool and to 50 ml of the solution add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 **Sulphate.**—To a further 25 ml of the solution produced in Test No 3 add 25 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Iron.**—To the remaining 25 ml of the solution produced in Test No 3 add 1 ml of dilute sulphuric acid and evaporate to dryness. Dissolve the residue in 50 ml of water and 0.5 ml of dilute hydrochloric acid. Add 0.5 g of zinc oxide and boil for 1 minute. Filter and wash with water. Dissolve the residue in 4 ml of dilute hydrochloric acid and 50 ml of water, add 0.5 g of zinc oxide and boil for 1 minute. Filter and wash with water. Redissolve the residue in 5 ml of dilute hydrochloric acid and 5 ml of water. Add 1 drop of $N/10$ $KMnO_4$ and 5 ml of ammonium thiocyanate solution. Any pink colour produced should not be greater than that obtained by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in a similar manner.

6 **Potassium.**—Dissolve 3 g in 10 ml of water and add the solution to a mixture of 5 ml of water and 2 ml of dilute acetic acid and allow to stand for 1 hour. No precipitate should be produced.

7 **Sensitivity.**—Repeat Test No 6 with the addition of 0.1 ml of potassium chloride solution (1 per cent). A distinct precipitate should be produced.

8 **Assay.**—Dissolve 2 g in 25 ml of dilute sulphuric acid and evaporate almost to dryness on a sand bath. Allow to cool, add 75 ml of water, 5 g of ammonium chloride, 0.5 g of hydrazine sulphate and 75 ml of strong ammonia solution. Heat to 60° to 70° and electrolyse for 1 hour with a current of 3.5 amperes using a weighed platinum cathode as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.

Weight of Co $\times 6.854$ = weight of $Na_2Co(NO_2)_6$

Not less than 95 per cent should be indicated

ANALAR**SODIUM DIETHYLDITHIOCARBAMATE**

Maximum Limit of Impurity

Sulphated Ash

31 to 32 per cent

Sensitivity to Copper (Cu) 1 50,000 000 minimum

2 **Solubility.**—Dissolve 1 g in 50 ml of water. The solution should be clear and colourless, and alkaline to thymolphthalein.

3 **Sulphated Ash.**—Moisten 2 g with sulphuric acid and ignite to constant weight. The residue should weigh not less than 31 per cent and not more than 32 per cent of the weight taken.

4 **Sensitivity to Copper.**—Add 10 ml of a 0.1 per cent aqueous solution to a mixture of 0.2 ml of standard copper solution (1 ml = 0.01 mg Cu), 50 ml of water and 2 ml of dilute ammonia solution, and dilute to 100 ml. A yellow-brown coloration should develop in the test solution, and a blank solution prepared as above, but with the copper omitted, should exhibit no similar colour.

ANALAR

SODIUM DIHYDROGEN PHOSPHATE



Maximum Limits of Impurities

Disodium phosphate (Na_2HPO_4)	0.3 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Lead (Pb)	0.0002 per cent
Iron (Fe)	0.002 per cent
Calcium and Magnesium	no reaction
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 **Description.**—Small colourless crystals.

2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction.**—Dissolve 5 g in 200 ml of water, the solution should have a pH value of 4.5 or should require not more than 0.1 ml N/1 HCl to adjust to that value.

4 **Chloride.**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate.**—Dissolve 2.5 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

6 **Lead.**—Dissolve 7 g in 30 ml of water and 15 ml of dilute ammonia solution, add 1 ml of potassium cyanide solution, dilute with water to 50 ml and add 2 drops of sodium sulphide solution. Any colour produced should not be greater than that produced by adding 2 drops of sodium sulphide solution to 50 ml of an aqueous solution containing

(Continued overleaf)

SODIUM DIHYDROGEN PHOSPHATE—continued

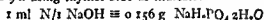
2 g of the sample, 15 ml of dilute ammonia solution, 1 ml of potassium cyanide solution and 1 ml of standard lead solution (1 ml = 0.01 mg Pb)

7 **Iron.**—Dissolve 1 g in 8 ml of water and add 4 ml of dilute hydrochloric acid and 1 drop of N/10 KMnO_4 mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 2 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

8 **Calcium and Magnesium**—Dissolve 10 g in 200 ml of water, render alkaline with dilute ammonia solution and allow to stand for 3 hours. No precipitate should be produced

9 **Arsenic**—Dissolve 5 g in 50 ml of water add 15 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain

10 **Assay**—Dissolve 5 g in 100 ml of water and titrate with N/1 NaOH to pH 9.2 using thymol blue as indicator



Not less than 99 per cent should be indicated

ANALAR**SODIUM HYDROGEN TARTRATE****Maximum Limits of Impurities**

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Loss on drying	8 to 10 per cent

1 **Description**—Colourless crystals or white crystalline powder

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained

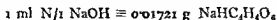
3 **Chloride**—Dissolve 1 g in 50 ml of water and add 2 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

4 **Sulphate**—Dissolve 1 g in 50 ml of water add 2 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Heavy Metals and Iron.**—Dissolve 1 g in 40 ml of water and 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2

6 Loss on Drying—Dry 7 g at 110° for 1 hour. The loss in weight should be not less than 0.56 g and not more than 0.70 g.

7 Assay.—Dissolve 5 g of the dried material from Test No. 6 in 50 ml of water and titrate with $N/1$ NaOH using phenolphthalein as indicator.



Not less than 99 per cent and not more than 100.5 per cent should be indicated.

ANALAR SODIUM HYDROXIDE



Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Phosphate (PO_4)	0.001 per cent
Silicate (SiO_2)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Aluminium (Al)	0.005 per cent
Zinc (Zn)	0.002 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)
Carbonate (Na_2CO_3)	2.0 per cent

1 Description—White deliquescent sticks or pellets.

2 Insoluble Matter—Dissolve 50 g, accurately weighed, in water, cool and dilute to 500 ml using carbon dioxide free water throughout. Not more than a very small amount of insoluble matter should be visible.

This solution is referred to as the 'sample solution' in the remaining clauses of this specification.

3 Chloride—Dilute 10 ml of the sample solution with 35 ml of water and add 6 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not exceed the "standard opalescence" defined in appendix 2.

4 Sulphate—Dilute 50 ml of the sample solution with 50 ml of water, add 27 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 Nitrate.—To 10 ml of the sample solution add cautiously 1 ml of sulphuric acid, cool, add 1 ml of standard indigo solution and 10 ml of

SODIUM HYDROXIDE—continued

sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Phosphate.—Dissolve 2 g in 20 ml of water in a platinum dish, neutralise with dilute sulphuric acid (about 10 ml), add 2 ml of acid in excess and dilute to 40 ml. To 20 ml (retain the remainder for Test No 7) add 2 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

7 Silicate.—To 1 ml of the solution retained from Test No 6 add 20 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

8 Heavy Metals and Iron.—To 10 ml of the sample solution add 5 ml of dilute hydrochloric acid, 10 ml of dilute ammonia solution and 25 ml of water and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 Aluminium.—To 10 ml of the sample solution add 10 ml of dilute acetic acid and 1 ml of a 0.1 per cent aqueous solution of ammonium aurine-tricarboxylate ("aluminon"), allow to stand for 5 minutes and then add 10 ml of ammonium carbonate solution. Any pink colour produced should not be deeper than that of a solution prepared in the following manner:—To 15 ml of water add 0.5 ml of standard aluminium solution (1 ml = 0.1 mg Al), 1 g of ammonium acetate, 5 ml of dilute acetic acid, 1 ml of "aluminon" solution and, after a lapse of 5 minutes, 10 ml of ammonium carbonate solution.

10 Zinc.—Neutralise 20 ml of the sample solution with dilute sulphuric acid (about 10 ml) and add 1 drop in excess. Add 1 drop of ammonium thiocyanate solution and 0.2 ml of a 0.05 per cent alcoholic solution of *p*-dimethylaminostyryl β -naphthylazole methyl iodide. The colour produced immediately should not be pink when compared with a solution containing 28 ml of water, 1 drop of dilute sulphuric acid, 1 drop of ammonium thiocyanate solution and 0.2 ml of the reagent solution.

Alternatively the following polarographic procedure may be employed:—Dissolve 10 g in 50 ml of water, de-oxygenate and polarograph over the range -0.9 volt to -1.4 volt. Return the solution in the polarographic cell, together with the mercury to the solution under test, add 0.2 ml of standard zinc solution (1 ml = 1 mg Zn), mix well and polarograph as before. The wave height obtained in the first experiment should not be greater than the increase in height obtained in the second experiment.

11. Ammonia.—Dilute 10 ml of the sample solution with 40 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to

50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

12 Arsenic—To 50 ml of the sample solution add 20 ml of brominated hydrochloric acid and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

13 Assay and Carbonate—To 20 ml of the sample solution add 2 ml of barium chloride solution and titrate with N/1 HCl using phenolphthalein as indicator.

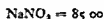
$$1 \text{ ml N/1 HCl} \equiv 0.040 \text{ g NaOH}$$

Then add bromophenol blue and continue the titration with N/1 HCl.

$$1 \text{ ml N/1 HCl} \equiv 0.053 \text{ g Na}_2\text{CO}_3$$

Not less than 96 per cent of NaOH, and not more than 2 per cent of Na_2CO_3 should be indicated.

ANALAR SODIUM NITRATE



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.005 per cent
Nitrite (NO_2)	0.0001 per cent
Iodate (IO_3)	0.00005 per cent
Phosphate (PO_4)	0.001 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent

1 Description—Colourless deliquescent crystals.

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Reaction—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 Chloride—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 Sulphate—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

(Continued overleaf)

SODIUM NITRATE—continued

6 **Nitrite and Iodate**—Dissolve 1 g in 10 ml of water, add 1 ml of dilute sulphuric acid, 1 ml of starch solution and 1 ml of cadmium iodide solution and allow to stand for 1 minute. No blue colour should be produced.

7 **Phosphate**—Dissolve 1 g in 20 ml of water, add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the 'standard colour' defined in appendix 2.

8 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

ANALAR SODIUM NITRITE



Maximum Limits of Impurities

Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Potassium (K)	0.02 per cent

1 **Description**—White or pale yellow hygroscopic crystals.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear solution should be produced.

3 **Chloride**—Dissolve 2 g in 45 ml of water and add 5 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

4 **Sulphate**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute nitric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

6 **Potassium**—Dissolve 2.5 g in 10 ml of water, add 3 ml of 10 per cent cobalt nitrate solution and 2 ml of dilute acetic acid and allow to stand for 1 hour. No turbidity or precipitate should be produced.

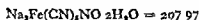
7 **Assay**—Dissolve 1 g in sufficient water to produce 250 ml, add this solution slowly from a burette to 50 ml of N/10 KMnO_4 acidified

with 10 ml of dilute sulphuric acid stirring vigorously throughout the titration and warming to 40° when approaching the end point



Not less than 98 per cent should be indicated

ANALAR SODIUM NITROPRUSSIDE



Maximum Limits of Impurities

Sulphate (SO_4)	0.01 per cent
Ferricyanide	0.01 per cent
Ferrocyanide	0.05 per cent

1 **Description**.—Ruby red crystals

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear deep red solution should be produced.

3 **Sulphate**.—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

4 **Ferricyanide**.—Dissolve 1 g in 10 ml of water and add 1 ml of a 10 per cent solution of ferrous sulphate. The turbidity produced should be reddish brown and completely free from any grey or greenish tint.

5 **Ferrocyanide**.—Dissolve 2 g in 20 ml of water. To 10 ml of this solution add 0.2 ml of ferric chloride solution. No colour change should be apparent when this solution is compared with the remaining 10 ml.

ANALAR SODIUM OXALATE



Maximum Limits of Impurities

Free Acid	0.5 ml N/1 per cent
Free Alkali	0.5 ml N/1 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Calcium (Ca)	0.003 per cent
Moisture	0.1 per cent

1 **Description**.—A white crystalline powder

(Continued overleaf)

SODIUM OXALATE—continued

2 **Solubility**—Dissolve 1 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—Dissolve 2 g in 100 ml of water, add 0.2 ml of phenolphthalein solution, boil and cool. The solution if colourless, should become pink on the addition of 0.1 ml of N/10 NaOH, or if pink should become colourless on the addition of 0.1 ml of N/10 HCl.

4 **Chloride**—Dissolve 1 g in 45 ml of warm water and add 5 ml of dilute nitric acid and 0.1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Ignite 1 g under conditions that will not introduce sulphur. Dissolve the residue in 15 ml of hot water, add 5 ml of hydrogen peroxide (20 volumes), boil, cool, add 5 ml of dilute hydrochloric acid and filter. To the filtrate add 30 ml of water and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

7 **Calcium**—Dissolve 10 g in 250 ml of hot water, filter, wash, dry any insoluble matter and weigh. Not more than 1 mg should be obtained.

8 **Moisture**—Dry 10 g of the finely powdered material at 130° for one hour. The loss in weight should not exceed 10 mg.

9 **Assay**—(a) Ignite gently 3 g of the dried material, obtained in Test No. 8, in a platinum dish until decomposition is complete. Boil the residue with 100 ml of water and 50 ml of N/1 H₂SO₄, filter and wash with hot water. Titrate the filtrate and washings with N/1 NaOH using methyl red as indicator.

$$1 \text{ ml N/1 H}_2\text{SO}_4 \equiv 0.0670 \text{ g (COONa)}_2$$

Not less than 99.9 per cent should be indicated.

(b) Dissolve 0.3 g of the dried material obtained in Test No. 8 in 50 ml of water, add 5 ml of sulphuric acid and titrate at 60° to 80° with N/10 KMnO₄.

$$1 \text{ ml N/10 KMnO}_4 \equiv 0.00670 \text{ g (COONa)}_2$$

Not less than 99.9 per cent should be indicated.

ANALAR SODIUM PEROXIDE



Maximum Limits of Impurities

Chloride (Cl)	0.04 per cent
Sulphate (SO_4)	0.005 per cent
Phosphate (PO_4)	0.005 per cent
Silicate (SiO_2)	0.01 per cent
Heavy Metals (Pb)	0.01 per cent
Iron (Fe)	0.005 per cent

1 **Description**.—A slightly yellowish hygroscopic powder.

2 **Solubility**.—Add 2 g in small portions to 50 ml of water. A clear solution should be produced.

3 **Chloride**.—Dissolve 0.25 g in 45 ml of water, add 5 ml of dilute nitric acid, boil, cool and add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

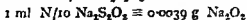
4 **Sulphate**.—Dissolve 5 g in 70 ml of water, add 30 ml of dilute hydrochloric acid, boil, add 2 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 **Phosphate**.—Dissolve 0.5 g in 20 ml of water in a platinum dish, add 3 ml of dilute sulphuric acid and evaporate to dryness. Dissolve the residue in 50 ml of water and to 20 ml (retain the remainder for Tests Nos. 6 and 7) add 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

6 **Silicate**.—To 5 ml of the solution retained from Test No. 5 add 15 ml of water, 1 ml of dilute sulphuric acid, 1 ml of phosphate reagent No. 1 and 1 ml of phosphate reagent No. 2 and place in a water-bath at 60° for 10 minutes. Any blue colour produced should not be deeper than the "standard colour" defined in appendix 2.

7 **Heavy Metals and Iron**.—To a further 20 ml of the solution produced in Test No. 5, add 25 ml of water, 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8 **Assay**.—To 0.2 g add a mixture of 10 ml of potassium iodide solution, 10 ml of dilute hydrochloric acid and 10 ml of water, and titrate the liberated iodine with $\text{N}/10 \text{ Na}_2\text{S}_2\text{O}_3$.



Not less than 85 per cent should be indicated.

ANALAR

SODIUM PHOSPHATE (ANHYDROUS)



Maximum Limits of Impurities

Reaction	pH 9.0 to 9.2
Carbonate	passes test
Chloride (Cl)	0.006 per cent
Sulphate (SO_4)	0.03 per cent
Heavy Metals (Pb)	0.003 per cent
Iron (Fe)	0.0015 per cent
Arsenic (As_2O_3)	0.0006 per cent (6 parts per million)
Pyrophosphate (P_2O_7)	0.2 per cent
Moisture	0.2 per cent

1 Description.—A white powder

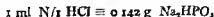
2 Solubility.—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3-8 Tests for Reaction, Carbonate, Chloride, Sulphate, Heavy Metals and Iron, and Arsenic are carried out as described for Sodium Phosphate (Hydrated) using in each case one third of the specified amount of the sample.

9 Pyrophosphate.—Dissolve 1 g in 20 ml of water and to 2 ml of this solution add 1 ml of a 10 per cent aqueous solution of cadmium sulphate, mix and add 10 ml of acetic acid slowly with shaking. No opalescence or turbidity should remain.

10 Moisture.—Dry 5 g at 120° for 1 hour. The loss in weight should not exceed 10 mg.

11 Assay.—Dissolve the dried material from Test No. 10 in 100 ml of water and titrate with N/1 HCl to pH 4.5 using bromocresol green as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR

SODIUM PHOSPHATE (HYDRATED)



Maximum Limits of Impurities

Reaction	pH 9.0 to 9.2
Carbonate	passes test
Chloride (Cl)	0.002 per cent
Sulphate (SO ₄)	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Arsenic (As ₂ O ₃)	0.0002 per cent
(2 parts per million)	

1 **Description**—Colourless efflorescent crystals

2 **Solubility**.—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

3 **Reaction**.—The reaction of a solution of 2 g in 100 ml of carbon dioxide free water should lie between the limits of pH 9.0 and 9.2 using thymol blue as indicator.

4 **Carbonate**.—Dissolve 5 g in 50 ml of boiling water and to the hot solution add 10 ml of dilute hydrochloric acid. No effervescence should be produced.

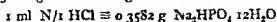
5 **Chloride**.—Dissolve 5 g in 40 ml of water and add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

6 **Sulphate**.—Dissolve 2.5 g in 50 ml of water, add 2.5 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 2 hours. No turbidity or precipitate should be produced.

7 **Heavy Metals and Iron**.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

8 **Arsenic**.—Dissolve 5 g in 50 ml of water, add 12 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

9 **Assay**.—Dissolve 6 g in 100 ml of water and titrate with N/1 HCl to pH 4.5 using bromocresol green as indicator.



Not less than 99 per cent and not more than 102 per cent should be indicated.

ANALAR SODIUM POTASSIUM TARTRATE



Maximum Limits of Impurities

Free Acid	1.0 ml N/1 per cent
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Reducing Substances	no reaction

1 **Description**.—Colourless crystals or a white crystalline powder.

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**.—Dissolve 1 g in 10 ml of carbon dioxide-free water and add 0.05 ml of phenolphthalein solution. The solution should be colourless, and should become pink on the addition of 0.1 ml of N/10 NaOH.

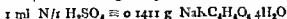
4 **Chloride**.—Dissolve 1 g in 50 ml of water and add 2 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**.—Dissolve 1 g in 50 ml of water, add 3 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 **Reducing Substances**.—Dissolve 10 g in 250 ml of hot water, add 20 ml of cupric sulphate solution and 15 ml of sodium hydroxide solution and heat in a water-bath at 95° for 30 minutes. No turbidity or precipitate should be produced.

8 **Assay**.—Ignite gently 5 g in a platinum dish until decomposition is complete. Boil the residue with 100 ml of water and 50 ml of N/1 H_2SO_4 , filter and wash with water. Titrate the filtrate and washings with N/1 NaOH using methyl red as indicator.



Not less than 99 per cent should be indicated.

ANALAR

SODIUM PYROPHOSPHATE



Maximum Limits of Impurities

Reaction	pH 10.2 to 11.2
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.001 per cent
Heavy Metals (Pb)	0.0005 per cent
Iron (Fe)	0.00025 per cent
Loss on ignition	40.0 to 41.0 per cent

1 **Description**—Colourless crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**—The reaction of a solution of 1 g in 20 ml of cold carbon dioxide-free water should lie between the limits of pH 10.2 and 11.2, determined electrometrically using a glass electrode of the special type for alkaline liquids.

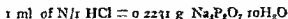
4 **Chloride**—Dissolve 2 g in 40 ml of water, add 10 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

5 **Sulphate**—Dissolve 2.5 g in 50 ml of water, add 2.5 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for two hours. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**—Dissolve 4 g in 45 ml of warm water, cool, add 5 ml of dilute ammonia solution, and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

7 **Loss on Ignition**—Ignite 2 g gently. The loss in weight should be not less than 0.80 g and not more than 0.82 g.

8 **Assay**.—Dissolve 6 g in 100 ml of water and titrate with N/1 HCl to pH 3.7 using bromophenol blue as indicator.



Not less than 99 per cent and not more than 102 per cent should be indicated.

ANALAR

SODIUM SELENATE



Maximum Limits of Impurities

Free Acid	0.25 ml N/1 per cent
Free Alkali	0.25 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.05 per cent
Nitrate (NO_3)	0.004 per cent
Selenite (SeO_3)	0.1 per cent

- 1 **Description**—White efflorescent crystals
- 2 **Solubility**—Dissolve 2 g in 50 ml of water. A clear colourless solution should be obtained.
- 3 **Reaction**—Dissolve 2 g in 20 ml of water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 H_2SO_4 or N/10 NaOH to render it so.
- 4 **Chloride**—Dissolve 2 g in 20 ml of water and add 30 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.
- 5 **Sulphate**—Dissolve 1 g in 100 ml of water and 30 ml of hydrochloric acid and 5 g of ammonium acetate. Heat nearly to boiling and then add 10 ml of 50 per cent w/w hydrazine hydrate solution. Boil until the selenium is precipitated as a black granular powder. Filter, wash and dilute to 250 ml with water. To 50 ml of this solution add 1 ml of barium chloride solution and allow to stand for 1 hour. Any turbidity produced should not be greater than that obtained by adding 1 ml of barium chloride solution to 50 ml of a blank solution containing 1 ml of standard sulphate solution (1 ml = 0.1 mg SO_4) and equivalent amounts of the reagents used above except selenium.
- 6 **Nitrate**—Dissolve 1 g in 10 ml of water. Warm and add 10 ml of barium chloride solution. Filter and to 10 ml of the filtrate add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.
- 7 **Selenite**—Dissolve 0.5 g in 100 ml of water and 50 ml of dilute sulphuric acid. Add 5 g of anhydrous sodium phosphate followed by 25 ml of N/100 KMnO_4 , stand for thirty minutes and then add 25 ml of N/100 $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4$ and back titrate with N/100 KMnO_4 . Not more than 1 ml of N/100 KMnO_4 should be required.
- 8 **Assay**—Dissolve 2 g in 60 ml of water. Add 15 ml of hydrochloric acid and 5 ml of 50 per cent w/w hydrazine hydrate solution. Boil and allow to stand on the steam bath overnight. Filter the precipitated

selenium on a sintered glass crucible or Gooch crucible, wash with hot water until free from chloride, and then with a little alcohol. Dry at 105° and weigh the selenium

$$\text{Weight of Se} \times 4.674 = \text{weight of Na}_2\text{SeO}_4 \cdot 10\text{H}_2\text{O}$$

Not less than 98 per cent should be indicated

ANALAR

SODIUM SULPHATE (ANHYDROUS)



Maximum Limits of Impurities

Free Acid	0.15 ml N/1 per cent
Free Alkali	0.15 ml N/1 per cent
Chloride (Cl)	0.0015 per cent
Nitrate (NO_3)	0.003 per cent
Nitrite (NO_2)	0.0006 per cent
Heavy Metals (Pb)	0.0012 per cent
Iron (Fe)	0.0006 per cent
Zinc (Zn)	0.0015 per cent
Ammonia (NH_3)	0.0015 per cent
Arsenic (As_2O_3)	0.0006 per cent
	(6 parts per million)
Oxidising and Reducing Substances	no reaction
Moisture	0.5 per cent

1 **Description**—A hygroscopic white powder or granules

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3-11 **Other Tests**—These tests should be carried out as described under Sodium Sulphate (Hydrated) Tests Nos 3 to 11 inclusive using one third the quantity of the anhydrous in place of the hydrated salt

12 **Moisture**—Ignite 5 g gently. The loss in weight should not exceed 25 mg

ANALAR SODIUM SULPHATE (HYDRATED)



Maximum Limits of Impurities

Free Acid	0.05 ml N/1 per cent
Free Alkali	0.05 ml N/1 per cent
Chloride (Cl)	0.0005 per cent
Nitrate (NO_3)	0.001 per cent
Nitrite (NO_2)	0.0004 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Zinc (Zn)	0.0005 per cent
Ammonia (NH_3)	0.0005 per cent
Arsenic (As_2O_3)	0.0002 per cent
	(2 parts per million)
Oxidising and Reducing Substances	no reaction
Loss on Ignition	55 to 56 per cent

1 **Description**—Colourless efflorescent crystals

2 **Solubility**.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Reaction**.—Dissolve 10 g in 100 ml of carbon dioxide free water. The solution should be neutral to bromothymol blue or should not require more than 0.05 ml of N/10 NaOH or N/10 HCl to render it so.

4 **Chloride**.—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Nitrate**.—Dissolve 2 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 **Nitrite**.—Dissolve 5 g in 45 ml of water and add 5 ml of dilute sulphuric acid and 2 ml of *m*-phenylenediamine sulphate solution. No yellow or orange colour should be produced.

7 **Heavy Metals and Iron**.—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. The solution should be free from opalescence and any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

8 **Zinc**.—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of potassium ferrocyanide solution and allow to stand for 1 hour. No opalescence should be produced.

9 **Ammonia**—Dissolve 2 g in 50 ml of water and add 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 2 ml of Nessler's reagent to 50 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).

10 **Arsenic**—Dissolve 5 g in 50 ml of water add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

11 **Oxidising and Reducing Substances**—Dissolve 5 g in 50 ml of water and add a colourless mixture of 1 ml of potassium iodide solution, 1 ml of starch solution and 0.5 ml of dilute hydrochloric acid. No blue colour should be produced but on the further addition of 0.05 ml of N/10 I the solution should become blue.

12 **Loss on Ignition**—Dry 2 g accurately weighed at 110° for 1 hour ignite gently and weigh the residue. The loss in weight should not be less than 1.10 g and not more than 1.12 g.

ANALAR SODIUM SULPHIDE



Maximum Limits of Impurities

Polysulphide	passes test
Sulphite and Thiosulphate (SO_2)	0.2 per cent

1 **Description**—Moist colourless crystals.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced which does not deposit any sediment on standing.

3 **Polysulphide**—Dissolve 1 g in 10 ml of water and add 2 ml of dilute hydrochloric acid. Not more than a slight turbidity should be produced immediately.

4 **Sulphite and Thiosulphate**—Dissolve 1 g in 100 ml of water and add 2 g of zinc sulphate dissolved in 100 ml of water allow to stand for 30 minutes filter and titrate the filtrate with N/10 I. Not more than 0.6 ml of N/10 I should be required.

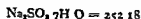
5 **Assay**—Dissolve 2.5 g in water and adjust the volume to 250 ml. Pipette 50 ml into a mixture of 50 ml of N/10 I, 400 ml of water and 25 ml of N/10 HCl and titrate the excess of iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$ using starch as indicator. Correct for sulphite and thiosulphate found in test No. 4.



Not less than 95 per cent should be indicated.

ANALAR

SODIUM SULPHITE



Maximum Limits of Impurities

Chloride (Cl)	0.005	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent
Arsenic (As_2O_3)	0.00002	per cent
	(0.2 part per million)	

1 **Description**—Colourless efflorescent crystals

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Chloride**.—Dissolve 2 g in 10 ml of dilute nitric acid and warm to remove most of the sulphur dioxide. Cool and add 40 ml of water and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

4 **Heavy Metals and Iron**.—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

5 **Arsenic**.—To 5 g add 10 ml of water, 2 g of potassium chlorate and 20 ml of hydrochloric acid, when the reaction has ceased, boil gently to remove chlorine, add 40 ml of water and a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.001 mg standard stain.

6 **Assay**.—Dissolve 0.3 g in 50 ml of N/10 I, add 2 ml of dilute hydrochloric acid and titrate the excess of iodine with N/10 $\text{Na}_2\text{S}_2\text{O}_3$.



Not less than 96 per cent should be indicated.

ANALAR

SODIUM THIOSULPHATE



Maximum Limits of Impurities

Reaction	pH 6.5 to 7.5
Sulphate and Sulphite (SO_4)	0.01 per cent
Sulphide (S)	0.0005 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Calcium (Ca)	0.005 per cent

- 1 **Description**—Colourless crystals free from white powder
- 2 **Solubility**—Dissolve 5 g in 50 ml of freshly boiled and cooled water. A clear colourless solution should be produced
- 3 **Reaction**—Dissolve 2 g in 20 ml of carbon dioxide free water. The reaction of the solution should be between pH 6.5 and pH 7.5
- 4 **Sulphate and Sulphite**—Dissolve 1 g in 10 ml of water, add N/10 I in slight excess (about 40 ml) and 1 ml of barium chloride solution. No turbidity or precipitate should be produced
- 5 **Sulphide**—Dissolve 1 g in 20 ml of water and add 0.05 ml of cupric sulphate solution. The solution should not darken in colour
- 6 **Heavy Metals and Iron**—Dissolve 2 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2
- 7 **Calcium**—Dissolve 2 g in 20 ml of water, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution and allow to stand for 2 hours. No turbidity or precipitate should be produced
- 8 **Assay**—Dissolve 1 g in 30 ml of water and titrate with N/10 I
 $1 \text{ ml N/10 I} \equiv 0.02482 \text{ g Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
 Not less than 99 per cent and not more than 101 per cent should be indicated

ANALAR

SODIUM TUNGSTATE



Maximum Limits of Impurities

Reaction	pH 8.0 to 9.5
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Loss on Ignition	10.5 to 11.5 per cent

(Continued overleaf)

SODIUM TUNGSTATE—continued

1. **Description.**—Colourless crystals or a white crystalline powder
2. **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced
3. **Reaction.**—The reaction of a solution of 1 g in 50 ml of carbon dioxide-free water should not be less than pH 8.0 and not more than pH 9.5, using thymol blue as indicator
4. **Chloride.**—Dissolve 2 g in 10 ml of hot water, add 5 ml of dilute nitric acid and heat on a water-bath for 5 minutes with frequent shaking, dilute with 35 ml of water, filter and to the filtrate add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2
5. **Sulphate.**—Dissolve 1 g in 5 ml of hot water, add 3 ml of dilute hydrochloric acid and heat on a water-bath for 5 minutes with frequent shaking, dilute with 45 ml of water, filter and to the filtrate add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced
6. **Nitrate.**—Dissolve 1 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid, heat to boiling and allow to stand for 5 minutes. The blue colour should not entirely disappear
7. **Loss on Ignition.**—Ignite 1 g gently. The loss in weight should be not less than 105 mg and not more than 115 mg
8. **Assay.**—Dissolve 0.5 g in 100 ml of water, add 3 ml of N/1 HCl and 10 ml of N/10 H₂SO₄, mix and add 25 ml of benzidine reagent,* allow to stand for 5 minutes, filter, wash with the benzidine reagent diluted with 15 parts of water, dry, ignite and weigh the resulting WO₃

$$\text{Weight of WO}_3 \times 1.422 = \text{weight of Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$$
 Not less than 99.3 and not more than 100.5 per cent should be indicated.

ANALAR STANNOUS CHLORIDE

**Maximum Limits of Impurities**

Sulphate (SO ₄)	0.005 per cent
Alkalis and other Metals (as sulphates)	0.1 per cent
Arsenic (As ₂ O ₃)	0.0001 per cent
	(1 part per million)

1. **Description.**—Colourless crystals
2. **Solubility.**—Dissolve 2 g in 40 ml of water and 5 ml of dilute hydrochloric acid. A clear colourless solution should be produced

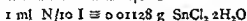
* **Benzidine Reagent.**—Dissolve 2.5 g of benzidine in 6 ml of dilute hydrochloric acid and 94 ml of water

3 Sulphate—Dissolve 2 g in 50 ml of water and 1 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

4 Alkalis and other Metals—Dissolve 2 g in 100 ml of water and 1 ml of dilute hydrochloric acid and remove the tin by means of hydrogen sulphide, filter, evaporate the filtrate to dryness, add 1 drop of sulphuric acid and ignite gently. Not more than 2 mg of residue should be obtained.

5 Arsenic—Dissolve 5 g in 20 ml of 20 per cent hydrochloric acid and distil 15 ml. To the distillate add 45 ml of water and test as described in appendix 4. Any stain produced should not be greater than a 0.005 mg standard stain.

6 Assay—Dissolve 0.5 g in 50 ml of water and 1 ml of dilute hydrochloric acid, add 5 g of sodium potassium tartrate and 3 g of sodium bicarbonate and titrate with N/10 I.



Not less than 97 per cent should be indicated.

ANALAR STARCH (SOLUBLE)

Maximum Limits of Impurities

Acidity	0.8 ml N/1 per cent
Sulphated Ash	0.3 per cent
Chloride (Cl)	0.005 per cent
Heavy Metals (Pb)	0.01 per cent
Iron (Fe)	0.005 per cent
Dextrin	passes test
Reducing Substances	passes test
Moisture	15.0 per cent

1 Description—A white powder.

2 Solubility—Shake 1 g with 5 ml of water and pour the suspension into 45 ml of boiling water, boil for 2 minutes and cool. The solution should be mobile and not more than slightly opalescent.

3 Acidity—A suspension of 5 g in 50 ml of carbon dioxide free water should be neutral to bromothymol blue, or should not require more than 0.4 ml of N/10 NaOH to render it so.

4 Sulphated Ash—Moisten 2 g with sulphuric acid and ignite gently. Not more than 6 mg of residue should be left.

5 Chloride—Shake 2 g with 20 ml of water for 5 minutes and filter. To the filtrate add 30 ml of water, 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

(Continued overleaf)

STARCH (SOLUBLE)—continued

6 Heavy Metals and Iron—To 10 ml of the solution produced in Test No 2, add 35 ml of water and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

7 Dextrin—To 20 ml of the solution produced in Test No 2, add 0.05 ml of N/10 I. A deep blue colour should be produced.

8 Reducing Substances—To 10 ml of the solution produced in Test No 2 add 0.1 ml of mixed Fehling's solution and 0.05 ml of a 0.1 per cent solution of methylene blue and heat in a boiling water-bath for 10 minutes. The blue colour should not entirely disappear.

9 Moisture—Dry 1 g at 100° for 1 hour. The loss in weight should not exceed 150 mg.

ANALAR STRONTIUM CHLORIDE



Maximum Limits of Impurities

Reaction	pH not less than 6.4
Sulphate (SO_4)	0.005 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.0005 per cent
Barium (Ba)	0.2 per cent
Calcium (Ca)	0.1 per cent
Alkalis (Na)	0.03 per cent

1 Description—Colourless crystals.

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 Reaction—The reaction of a solution of 1 g in 50 ml of carbon dioxide free water should not be less than pH 6.4 using bromothymol blue as indicator.

4 Sulphate—Dissolve 2 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 6 hours. No turbidity or precipitate should be produced.

5 Nitrate—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

6 Heavy Metals and Iron—Dissolve 2 g in 45 ml of carbon dioxide-free water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

7 **Barium**.—Dissolve 0.5 g in 25 ml of water, add 1 drop of acetic acid and 0.5 ml of potassium chromate solution. No turbidity or precipitate should be produced.

8 **Calcium**.—Treat 2.5 g, accurately weighed, with 5 ml of sulphuric acid and take to dryness on a sand bath. Cool, and to the residue add 25 ml of perchloric acid (60 per cent) and heat again on the sand bath for 10 minutes. Cool and add 100 ml of boiling water and 5 ml of a mixture of equal volumes of sulphuric acid and water. Boil for a few minutes with stirring, allow to stand overnight, filter on a No. 42 Whatman paper or on a sintered alundum crucible and wash the solid free from acid. Retain the solid for the Assay. To the filtrate add ammonia in slight excess, boil, add 1 g of ammonium oxalate and allow to stand for 30 minutes. Filter, wash with water, burn the filter, moisten the residue with sulphuric acid, ignite gently and weigh. Not more than 8 mg should be obtained.

9 **Alkalis**.—Dissolve 5 g in 100 ml of water and add 10 ml of dilute ammonia solution and 20 ml of ammonium carbonate solution. Warm for a few minutes, filter and wash the precipitate with water. Evaporate the filtrate and washings to dryness and ignite the residue gently to remove ammonium salts. Dissolve the residue in 10 ml of water and 1 ml of dilute nitric acid, add 2 ml of dilute ammonia solution and 2 ml of ammonium oxalate solution, allow to stand for 1 hour and filter. Evaporate the filtrate to dryness, to the residue add 2 drops of sulphuric acid and ignite. Not more than 5 mg of residue should be obtained.

10 **Assay**.—Ignite the washed strontium sulphate obtained in Test No. 8 and weigh.

$$\text{Weight of SrSO}_4 \times 1.452 = \text{weight of SrCl}_2 \cdot 6\text{H}_2\text{O}$$

Not less than 98 per cent should be indicated.

ANALAR SUCCINIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.003 per cent
Sulphate (SO ₄)	0.005 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent
Reducing Substances (O)	0.008 per cent

1 **Description**.—Colourless crystals.

2 **Solubility**.—Dissolve 5 g in 50 ml of warm water. A clear colourless solution should be produced.

(Continued overleaf)

SUCCINIC ACID—continued

3 **Melting Point.**—186° to 188°

4 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

5 **Chloride.**—Dissolve 3 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

6 **Sulphate.**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

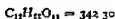
7 **Heavy Metals and Iron.**—Dissolve 1 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2.

8 **Reducing Substances**—Dissolve 1 g in 20 ml of hot water, cool to about 60°, add 0.1 ml of N/10 KMnO_4 and allow to stand for 5 minutes. The pink colour should not entirely disappear.

9 **Assay**—Dissolve 2 g in 50 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator.



Not less than 99 per cent should be indicated.

ANALAR**SUCROSE****Maximum Limits of Impurities**

Sulphated Ash	0.02 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent
Reducing Sugars ($\text{C}_6\text{H}_{12}\text{O}_6$)	0.01 per cent
Nitrogen (N)	0.005 per cent
Moisture	0.1 per cent

1 **Description.**—Colourless crystals or a crystalline powder.

2 **Solubility**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.

3 **Sulphated Ash**—Moisten 10 g with sulphuric acid and ignite again, moisten with sulphuric acid and re-ignite. Not more than 2 mg of residue should be left.

4 **Chloride**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

5 **Sulphate**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 **Heavy Metals and Iron**—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

7 **Reducing Sugars**—Dissolve 1 g in 10 ml of hot water, add 0.2 g of potassium citrate, 1 ml of cupric sulphate solution and 1 ml of N/1 Na_2CO_3 and place in a boiling water bath for 5 minutes. No turbidity or precipitate should be produced.

8 **Nitrogen**—Digest 1 g with 20 ml of sulphuric acid and 0.05 g of cupric sulphate until completely oxidised. Cool, dilute with water, render alkaline with sodium hydroxide, distil and collect the distillate in 10 ml of N/100 H_2SO_4 and titrate the excess of acid with N/100 NaOH using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 0.35 ml.

9 **Moisture**—Dry 5 g of the finely powdered material at 100° for 1 hour. The loss in weight should not exceed 5 mg.

ANALAR SULPHANILIC ACID



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO_4)	0.005 per cent

1 **Description**—White crystals or a crystalline powder.

2 **Solubility**—Dissolve 3 g in 100 ml of hot water. A clear colourless solution should be produced.

3 **Sulphated Ash**—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

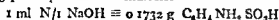
4 **Chloride**—Dissolve 5 g in 100 ml of hot water, add 2 ml of dilute nitric acid, cool and filter. To 40 ml of the filtrate add 10 ml of water and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2.

(Continued overleaf)

SULPHINILIC ACID—continued

5 Sulphate.—To a further 40 ml of the filtrate produced in Test No 4 add 10 ml of water and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 Assay.—Suspend 5 g in 100 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator.

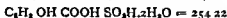


Not less than 99 per cent should be indicated.

ANALAR

SULPHOSALICYLIC ACID

(Salicylsulphonic Acid)



Maximum Limits of Impurities

Sulphated Ash	0.025 per cent
Chloride (Cl)	0.005 per cent
Sulphate (SO ₄)	0.005 per cent
Salicylate (C ₆ H ₅ O ₂)	0.001 per cent
Heavy Metals (Pb)	0.002 per cent
Iron (Fe)	0.001 per cent

1 Description.—White or cream coloured crystals or crystalline powder.

2 Solubility.—Dissolve 5 g in 20 ml of water. An almost clear solution should be produced.

3 Sulphated Ash.—Moisten 2 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left.

4 Chloride.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

5 Sulphate.—Dissolve 2 g in 50 ml of water and add 1 ml of barium chloride solution. No turbidity or precipitate should be produced.

6 Salicylate.—Shake 0.5 g of the powdered material with 5 ml of benzene and filter through a dry paper. Shake the filtrate with 5 ml of water and 1 drop of ferric chloride solution. No violet colour should be produced.

7 Heavy Metals.—Dissolve 1 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

8 Iron.—Dissolve 1 g in 50 ml of water and add 1 drop of hydrogen peroxide (20 volumes). Any pink colour produced should not be greater

than that given by 50 ml of water containing 0.01 g of sulphosalicylic acid, 1 ml of standard iron solution (1 ml = 0.01 mg Fe) and 1 drop of hydrogen peroxide

9 Assay—Dissolve 5 g in 100 ml of water and titrate with N/1 NaOH using phenol red as indicator

1 ml N/1 NaOH \equiv 0.1271 g $\text{C}_6\text{H}_4(\text{OH})\text{COOH}\cdot\text{SO}_3\text{H}\cdot 2\text{H}_2\text{O}$

Not less than 99 per cent should be indicated

ANALAR SULPHURIC ACID (sp. gr. 1.84)

$\text{H}_2\text{SO}_4 = 98.076$

Maximum Limits of Impurities

Non-volatile Matter	0.0025 per cent
Chloride (Cl)	0.0003 per cent
Nitrate (NO_3)	0.00002 per cent
Selenium (Se)	0.001 per cent
Heavy Metals (Pb)	0.0002 per cent
Iron (Fe)	0.0001 per cent
Ammonia (NH_3)	0.0005 per cent
Oxygen absorbed (O)	0.0001 per cent
Arsenic (As_2O_3)	0.00001 per cent
(0.1 part per million)	

1 Description—A clear colourless oily liquid

2 Non-volatile Matter—Evaporate 20 g to dryness and ignite gently. Not more than 0.5 mg of residue should be left

3 Chloride—Dilute 2 ml with 50 ml of water and add 1 ml of silver nitrate solution. No opalescence should be produced

4 Nitrate—Dilute 6 ml with 2 ml of water, cool to about 60° and add 1 drop of hydrochloric acid and 1 ml of diphenylamine reagent. No blue colour should be produced

5 Selenium—Dilute 1 ml with 10 ml of water and add 1 ml of hydrochloric acid and 5 ml of a 2 per cent aqueous solution of hydrazine sulphate, heat the solution to boiling and allow to stand for 10 minutes. No red colour or turbidity should be produced

6 Heavy Metals and Iron—Dilute 5 ml with 30 ml of water, cool, add 15 ml of strong ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2

7 Ammonia—Dilute 1 ml with 40 ml of water, add 10 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour

(Continued overleaf)

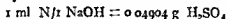
SULPHURIC ACID—continued

produced should not exceed that given by the addition of 10 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 40 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3)

8 Oxygen Absorption—To 60 ml of water containing 0.05 ml of N/10 KMnO_4 add 15 ml of the acid. The pink colour should persist for at least 5 minutes

9 Arsenic—Dilute 11 ml with 50 ml of water, add 0.2 ml of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than 2.0002 mg standard stain

10 Assay—Dilute 2 g with 40 ml of water and titrate with N/1 NaOH using methyl red as indicator



Not less than 98 per cent should be indicated

ANALAR**TARTARIC ACID****Maximum Limits of Impurities**

Ash	0.02 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.002 per cent
Heavy Metals (Pb)	0.0008 per cent
Iron (Fe)	0.0004 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

1 Description—Colourless crystals

2 Solubility—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced

3 Ash—Ignite 10 g gently, not more than 2 mg of residue should be left

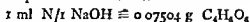
4 Chloride—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

5 Sulphate—Dissolve 5 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

6 Heavy Metals and Iron—Dissolve 2.5 g in 40 ml of water, add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the 'standard colours' defined in appendix 2

7 Arsenic.—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.

8 Assay.—Dissolve 3 g in 50 ml of water and titrate with N/1 NaOH using phenolphthalein as indicator.



Not less than 99.5 per cent should be indicated.

ANALAR TELLURIC ACID



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO ₄)	0.01 per cent
Nitrate (NO ₃)	0.05 per cent
Selenium (Se)	passes test
Iron (Fe)	0.001 per cent

1 Description.—White crystals or crystalline powder.

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained.

3 Chloride.—Dissolve 1 g in 50 ml of water and add 1 ml of nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

4 Sulphate.—Dissolve 1 g in 50 ml water, add 1 ml of dilute hydrochloric acid and 1 ml barium chloride solution, and allow to stand for one hour. No turbidity or precipitate should be produced.

5 Nitrate.—Dissolve 1 g in 10 ml of water, add 1 drop of dilute sulphuric acid and 1 ml of a 10 per cent solution of nitroa in 10 per cent acetic acid and allow to stand for 30 minutes. No crystalline precipitate should be produced.

6 Selenium.—Dissolve 1 g in 10 ml of hydrochloric acid, boil down to about 5 ml and make up to 20 ml with hydrochloric acid. Saturate the acid solution with sulphur dioxide. No red precipitate should be produced.

7 Iron.—Dissolve 1 g in 10 ml of water and 1 ml of dilute hydrochloric acid and add 1 drop of N/10 KMnO₄, mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that

(Continued overleaf)

TELLURIC ACID—continued

produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

8 Assay—Dissolve 0.5 g in 20 ml of hydrochloric acid and boil gently under reflux for 4 hours. Cool, wash down the condenser with 20 ml of water and transfer to a beaker, washing out the flask with dilute hydrochloric acid. Dilute to 150 ml with dilute hydrochloric acid, heat to boiling and precipitate the tellurium with sulphur dioxide. Filter through a sintered glass crucible, wash with water and alcohol and dry at 105°.

Weight of Te \times 1.799 = weight of $\text{H}_2\text{TeO}_4 \cdot 2\text{H}_2\text{O}$

Not less than 99.5 per cent should be indicated

ANALAR THALLIUM SULPHATE

$\text{Tl}_2\text{SO}_4 = 504.85$

Maximum Limits of Impurities

Chloride (Cl)	0.01 per cent
Nitrate (NO_3)	0.002 per cent
Copper (Cu)	no reaction

1 Description—Colourless crystals or white crystalline powder

2 Solubility—Dissolve 1 g in 50 ml of water. A clear colourless solution should be produced.

3 Chloride—Dissolve 1 g in 50 ml of water, add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the 'standard opalescence' defined in appendix 2.

4 Nitrate—Dissolve 0.5 g in 10 ml of water, add 0.5 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

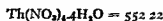
5 Copper—Dissolve 2 g in 40 ml of water and add 10 ml of dilute ammonia solution. No blue colour should be produced.

6 Assay—Dissolve 1 g in 20 ml of water and add 60 ml of hydrochloric acid. Titrate with $\text{M}/20 \text{ KIO}_3$ with vigorous shaking, adding 0.5 ml of chloroform towards the completion of the reaction, and continuing the titration until the globule of chloroform becomes colourless.

1 ml of $\text{M}/20 \text{ KIO}_3 \equiv 0.02524 \text{ g } \text{Tl}_2\text{SO}_4$

Not less than 99 per cent should be indicated

ANALAR THORIUM NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.002 per cent
Sulphate (SO_4)	0.005 per cent

1 **Description** — White deliquescent crystals or crystalline powder

2 **Solubility** — Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained

3 **Chloride** — Dissolve 5 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the standard opalescence defined in appendix 2

4 **Sulphate** — Dissolve 2 g in 50 ml of water add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Assay** — Dissolve 0.3 g in 25 ml of water. Add 150 ml of a 0.4 per cent aqueous solution of *m* nitrobenzoic acid and 2 drops of hydrazine hydrate solution. Heat to 80° and keep at this temperature for 10 minutes. Allow to stand for 1 hour filter on a Whatman No. 41 paper and wash with water containing 5 per cent of the reagent solution. Place in a platinum crucible whilst still wet and burn off carefully to ThO_2 .

Weight of $\text{ThO}_2 \times 2.091$ — weight of $\text{Th}(\text{NO}_3)_4 \cdot 4\text{H}_2\text{O}$

Not less than 98 per cent should be indicated

ANALAR TIN



Maximum Limits of Impurities

Lead (Pb)	0.01 per cent
Copper (Cu)	0.0025 per cent
Bismuth (Bi)	0.002 per cent
Iron (Fe)	0.002 per cent
Total Foreign Metals	0.04 per cent
Arsenic (As_2O_3)	0.0001 per cent (1 part per million)
Antimony (Sb)	0.025 per cent

1 **Description** — A silver white metal

(Continued overleaf)

TIN—continued

2 Preparation of Solutions for Lead, Copper, Bismuth, Iron and Arsenic Tests—(a) Mix 10 g with 25 ml of water and 50 ml of hydrochloric acid and add 10 g of potassium chlorate in small portions at a time, at such a rate that a slight excess of chlorine is maintained throughout, until all the metal is dissolved, cooling if necessary. Boil off the excess of chlorine, cool and dilute with water to produce 100 ml.

(b) To 50 ml of the above solution add 25 g of tartaric acid, and sufficient dilute ammonia solution (about 100 ml) to produce a clear alkaline solution, transfer to a separator and shake with three separate 10 ml portions of a 0.1 per cent solution of diphenylthiocarbazone in chloroform. Draw off each portion of the chloroform extract and wash in turn with 10 ml of a 5 per cent solution of tartaric acid rendered alkaline with ammonia. Evaporate the chloroform from the combined extracts, add 1 ml of sulphuric acid, heat to fuming and add drop by drop 0.5 ml of nitric acid, again heat to fuming, cool, add 0.5 ml of water and heat to fuming a third time. To the cooled residue add 10 ml of water, 10 g of ammonium acetate, 5 ml of dilute ammonia solution and sufficient water to produce 50 ml.

3 Lead.—To 10 ml of solution 2b add 5 ml of dilute ammonia solution, 1 ml of potassium cyanide solution, 35 ml of water and 2 drops of sodium sulphide solution. Any colour produced should not be deeper than that given by the addition of 2 drops of sodium sulphide solution to 50 ml of solution containing 10 ml of standard lead solution (1 ml = 0.01 mg Pb). 2 g of ammonium acetate, 5 ml of dilute ammonia solution and 1 ml of potassium cyanide solution.

4 Copper.—To 10 ml of solution 2b add 2 ml of dilute acetic acid, 3 drops of pyridine, 1 ml of ammonium thiocyanate solution and 2 ml of chloroform, shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not exceed that given by 2.5 ml of standard copper solution (1 ml = 0.01 mg Cu) and 1 g of ammonium acetate in 10 ml of water with the quantities of reagents used in the test and treated in the same manner.

5 Bismuth.—To 10 ml of solution 2b add 10 ml of dilute sulphuric acid and 0.05 g of sodium azide, then add 1 ml of potassium iodide solution, shake and add 2 ml of ethyl acetate, again shake and allow to separate. Any yellow colour produced in the ethyl acetate layer should not exceed that given by 2 ml of standard bismuth solution (1 ml = 0.01 mg Bi) and 2 g of ammonium acetate in an equal volume of solution containing the quantities of reagents used in the test and treated in the same manner.

6 Iron.—To 5 ml of solution 2a add 5 ml of water, 1 ml of dilute hydrochloric acid and 1 drop of $N/10$ $KMnO_4$, mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.

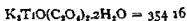
7. **Total Foreign Metals.**—Heat 2.5 g. with 15 ml. of nitric acid on a water-bath until all the metal is oxidised, then evaporate to dryness; cool, digest with 3 ml. of dilute nitric acid and 30 ml. of water for 5 minutes and filter. Evaporate the filtrate to dryness, ignite and weigh the residue. Not more than 1 mg. should be obtained

8. **Arsenic.**—To 20 ml. of solution 2a, add 15 ml. of hydrochloric acid and a few drops of stannous chloride solution and distil 25 ml. To the distillate add 40 ml. of water and test as described in appendix 4. Any stain produced should not be greater than a 0.002 mg. standard stain.

9. **Antimony.**—To the distillation residue from Test No. 8 add 2 g. of tartaric acid, 10 ml. of hydrochloric acid and dilute to 100 ml. with water. Add a loosely coiled piece of copper foil (15 × 100 millimetres) previously freed from grease and treated with a mixture of equal volumes of nitric acid and water until a moderate reaction sets in, and subsequently washed with water. Boil the solution gently for 1 hour, replacing the water lost by evaporation. Any darkening of the foil should not be greater than that produced in a similar test containing 13 ml. of hydrochloric acid, 2 g. of tartaric acid and 0.5 ml. of standard antimony solution (1 ml. = 1 mg. Sb).

AÑALAR

TITANYL POTASSIUM OXALATE



Maximum Limits of Impurities

Reaction	pH 3.0 to 3.6
Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.02 per cent
Nitrate (NO_3)	0.002 per cent
Heavy Metals (Pb)	0.04 per cent
Iron (Fe)	0.005 per cent.

1. **Description.**—White crystals or a crystalline powder.

2. **Solubility.**—Dissolve 1 g. in 50 ml. of water. A clear colourless solution should be produced.

3. **Reaction.**—The reaction of a solution of 1 g. in 50 ml. of carbon dioxide-free water should lie between the limits of pH 3.0 and pH 3.6 using bromophenol blue as indicator

4. **Chloride.**—Dissolve 1 g. in 50 ml. of water and add 1 ml. of dilute nitric acid and 1 ml. of silver nitrate solution. No opalescence should be produced.

5. **Sulphate.**—Dissolve 1 g. in 10 ml. of water, add 10 ml. of dilute hydrochloric acid and 1 g. of potassium permanganate in small portions and boil. Clear with 25 ml. of hydrogen peroxide (20 volumes), add 10 ml.

(Continued overleaf)

TITANYL POTASSIUM OXALATE—*continued*

of dilute ammonia solution, dilute with water to 50 ml. and filter through a No 41 Whatman filter paper. To 25 ml of the filtrate add 2 ml of dilute hydrochloric acid and 2 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

6 Nitrate.—Dissolve 1 g in 10 ml of water, add 1 ml. of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.

7 Heavy Metals.—Dissolve 0.5 g in 50 ml of water. To 5 ml add 40 ml of water, 1 g of ammonium tartrate and 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the standard colours defined in appendix 2.

8 Iron.—Dissolve 0.2 g in 3 ml of dilute sulphuric acid and heat to boiling. Add 0.1 g of potassium permanganate and boil, followed by a 10 per cent aqueous solution of hydroxylamine hydrochloride drop by drop until the brown colour is discharged and then 2 ml in excess. Dilute to 20 ml with water, add 1 g of ammonium tartrate, 2 g of sodium acetate and 1 ml of a 0.5 per cent aqueous solution of *o*-phenanthroline. Allow to stand for 10 minutes. Any pink colour produced should not be greater than that shown by 1 ml of standard iron solution (1 ml = 0.01 mg Fe) treated similarly.

9 Assay.—Reflux 3.5 g with 20 ml of sulphuric acid until decomposed. Cool, dilute with water to 250 ml. Set up a Jones reductor and reactivate the amalgam by passing a mixture of 40 ml of dilute sulphuric acid and 60 ml of water through the column followed by 100 ml of water.

(a) *Blank*.—Introduce 50 ml of acid ferric ammonium sulphate solution* into the receiver flask of the reductor, pass 200 ml of N/1 H_2SO_4 through the column followed by 100 ml of water and titrate the contents of the receiver with N/10 $KMnO_4$.

(b) *Determination*.—Introduce 50 ml of acid ferric ammonium sulphate solution into the receiver, run 100 ml of N/1 H_2SO_4 through the column, followed by 50 ml of the prepared solution diluted with 70 ml of water and 30 ml of dilute sulphuric acid. Then run through 100 ml of N/1 H_2SO_4 followed by 100 ml of water. Titrate the contents of the receiver flask with N/10 $KMnO_4$ and deduct the value of the blank.

$$1 \text{ ml N/10 } KMnO_4 = 0.03542 \text{ g } K_2TiO(C_2O_4)_2 \cdot 2H_2O$$

Not less than 98.5 per cent should be indicated.

* Acid ferric ammonium sulphate solution contains 150 g of ferric ammonium sulphate and 150 ml of sulphuric acid in 1 litre.

ANALAR o-TOLIDINE



Maximum Limits of Impurities

Sulphated Ash	0.1 per cent
Moisture	0.1 per cent

Sensitivity to Chlorine (Cl) 1 50,000,000 minimum

- 1 **Description**.—White or cream coloured crystalline powder
- 2 **Solubility**.—Slightly soluble in water. Dissolve 1 g in 20 ml of 95 per cent alcohol. A clear solution should be produced.
- 3 **Melting Point**.—128° to 130°
- 4 **Sulphated Ash**.—Moisten 2 g with sulphuric acid and ignite gently. Not more than 2 mg of residue should be left.
- 5 **Moisture**.—Dry 5 g at 100° for 1 hour. The loss in weight should not exceed 5 mg.
- 6 **Sensitivity**.—Dissolve 0.1 g in 10 ml of hydrochloric acid and dilute with freshly distilled water to 100 ml. To 50 ml of freshly distilled water containing 0.02 parts per million of free chlorine, add 0.5 ml of the above solution of the sample and allow to stand for five minutes. A distinct yellow colour should be observed when compared with a similar volume of water containing the reagents above but with no added chlorine.

ANALAR p-TOLUIDINE



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
p-Toluidine	0.25 per cent

- 1 **Description**.—White crystals or crystalline powder, becoming coloured under the influence of light and air.
- 2 **Solubility**.—Sparingly soluble in water. Readily soluble in alcohol. Dissolve 5 g in a mixture of 10 ml of dilute hydrochloric acid and 20 ml of water. The warm solution should have no odour of nitrotoluene and on cooling to 10° no turbidity should be produced.
- 3 **Melting Point**.—42° to 45°
- 4 **Sulphated Ash**.—Moisten 2 g with sulphuric acid and ignite gently. Not more than 1 mg of residue should be left.

p TOLUIDINE—contd. *ued*

5 *o* Toluidine—Shake 1 g with 20 ml of water add 2 drops of a 1 per cent aqueous solution of *p*-phenylenediamine hydrochloride and 1 drop of ferric chloride solution shake and observe immediately There should be no transient green coloration

6 Assay—Dissolve 0.4 g in 20 ml of water and 2 ml of dilute hydrochloric acid and dilute with water to 250 ml To 25 ml of the solution in a stoppered bottle add 20 ml of water 50 ml of N/10 bromate-bromide solution and 10 ml of dilute hydrochloric acid Leave to stand for ten minutes add a solution of 3 g of potassium iodide dissolved in 10 ml of water and titrate the liberated iodine with N/10 Na₂S₂O₃ using starch as indicator Run a blank on the reagents used

1 ml N/10 bromate-bromide = 0.001786 g CH₃C₆H₄NH₂

Not less than 99 per cent should be indicated

ANALAR TRICHLOROACETIC ACID

CCl₃COOH = 163.40

Maximum Limits of Impurities

Non volatile Matter	0.01	per cent
Chloride (Cl)	0.001	per cent
Sulphate (SO ₄)	0.001	per cent
Nitrate (NO ₃)	0.002	per cent
Phosphate (PO ₄)	0.001	per cent
Heavy Metals (Pb)	0.001	per cent
Iron (Fe)	0.0005	per cent

1 Description—Colourless deliquescent crystals with a pungent odour

2 Solubility—Dissolve 5 g in 50 ml of water A clear colourless solution should be produced

3 Freezing Point—Not below 56°

4 Non-volatile Matter—Ignite 10 g gently not more than 1 mg of residue should be left

5 Chloride—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution No opalescence should be produced

6 Sulphate—Dissolve 5 g in 10 ml of water and add 40 ml of a 0.5 per cent w/v solution of benzidiox in acetone No opalescence or turbidity should be produced

7 Nitrate—Dissolve 1 g in 10 ml of water add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling The blue colour should not entirely disappear

8 Phosphate—Dissolve 1 g in 20 ml of water add 3 ml of dilute sulphuric acid 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water bath at 60° for 10 minutes Any blue colour produced should not be deeper than the standard colour defined in appendix 2

9 Heavy Metals and Iron—Dissolve 2 g in 40 ml of water add 10 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds Any colour produced should not be deeper than the standard colours defined in appendix 2

10 Assay—Dissolve 5 g in 50 ml of water and titrate with N/1 NaOH using phenol red as indicator

$$1 \text{ ml N/1 NaOH} = 0.1634 \text{ g CCl}_3\text{COOH}$$

Not less than 99 per cent should be indicated

ANALAR

TRIKETOHYDRINDENE HYDRATE



Maximum Limit of Impurity

Sulphated Ash

0.1 per cent

Sensitivity passes test

1 Description—White to flesh-coloured crystals or crystalline powder

2 Solubility—Dissolve 1 g in 20 ml of water A clear solution should be produced

3 Melting Point.—Not below 250°

4 Sulphated Ash—Moisten 0.5 g with sulphuric acid and ignite gently Not more than 0.5 mg of residue should be left

5 Sensitivity—Add 0.1 ml of a 0.25 per cent aqueous solution to 1 ml of a 0.02 per cent solution of amino acetic acid and heat on a water bath for fifteen minutes A distinct purple colour should be produced

6 Assay—Weigh 0.5 g into a stoppered tube and add 20 ml of hydroxylamine hydrochloride-dimethyl yellow reagent* and 5 ml of water Place in a water bath at 75° to 85° Neutralise the liberated acid at

* The reagent is prepared by dissolving 7 g of hydroxylamine hydrochloride in 95 ml of 90 per cent alcohol add 0.4 ml of dimethyl yellow solution adjusting to the full yellow colour with N/1 alcohol c KOH and making the volume up to 100 ml

(Continued overleaf)

TRIKETOHYDRINDENE HYDRATE—continued

5-minute intervals with N/1 alcoholic KOH, and continue heating and neutralising until the reaction is at an end. Carry out a duplicate determination and use the first reaction liquid plus a slight excess (0.2 ml) of the alcoholic KOH as a colour standard for the end point. Correct the volume of N/1 KOH used by multiplying by the factor 1.008.

$$1 \text{ ml of N/1 KOH} \equiv 0.05938 \text{ g } C_9H_4O_3 \cdot H_2O$$

Not less than 95 per cent should be indicated

ANALAR

URANYL ACETATE

Approximate formula $UO_2(CH_3COO)_2 \cdot 2H_2O \approx 424.19$

Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.004 per cent
Iron (Fe)	0.002 per cent
Calcium (Ca)	0.005 per cent
Alkalis and other Metals (as sulphates)	0.3 per cent
Ammonia	no reaction
Uranous Salt (U)	0.1 per cent

1 **Description.**—A bright yellow crystalline powder

2 **Solubility.**—Dissolve 5 g in 45 ml of water and 5 ml of dilute acetic acid. A clear yellow solution should be produced.

3 **Chloride.**—Dissolve 1 g in 50 ml of water and 1 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced.

4 **Sulphate.**—Dissolve 2 g in 50 ml of water and 1 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Heavy Metals and Iron.**—Pass hydrogen sulphide for a few seconds through the solution obtained in Test No. 6. Not more than a very faint darkening should be produced.

6 **Calcium.**—Dissolve 1 g in 40 ml of water and 10 ml of ammonium carbonate solution. A clear solution should be produced.

7 **Alkalis and other Metals.**—Dissolve 2 g in 50 ml of water, heat to boiling and add 5 ml of dilute ammonia solution. Filter, evaporate the filtrate to dryness, moisten with sulphuric acid and ignite gently. Not more than 6 mg of residue should be obtained.

8 **Ammonia.**—Dissolve 1 g in 10 ml of water, add 5 ml of

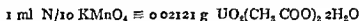
sodium hydroxide solution and boil. No odour of ammonia should be perceptible.

9 Uranous Salt—Dissolve 1 g in 20 ml of water and 5 ml of dilute sulphuric acid and add 0.1 ml of N/10 KMnO_4 . The pink colour should not entirely disappear.

10 Assay—Dissolve 0.7 g in 5 ml of sulphuric acid and heat until white fumes are evolved. Cool, add 3 ml of nitric acid and again heat to fuming. Cool, mix with 10 ml of water and reheat to fuming. Repeat this last procedure twice. Cool and dilute with water to 100 ml. Set up a Jones reductor and reactivate the amalgam by passing a mixture of 40 ml of dilute sulphuric acid and 60 ml of water through the column followed by 100 ml of water.

(a) *Blank*—Pass 200 ml of N/1 H_2SO_4 through the column, followed by 100 ml of water, bubble air through the contents of the receiver flask for 10 minutes and then titrate with N/10 KMnO_4 .

(b) *Determination*—Run 100 ml of N/1 H_2SO_4 through the column, followed by the prepared solution. Then run through 100 ml of N/1 H_2SO_4 , followed by 100 ml of water. Bubble air through the contents of the receiver flask for 10 minutes, titrate with N/10 KMnO_4 and deduct the value of the blank.



Not less than 98 per cent should be indicated.

ANALAR URANYL NITRATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.004 per cent
Iron (Fe)	0.002 per cent
Calcium (Ca)	0.005 per cent
Alkalis and other Metals (as sulphates)	0.3 per cent
Ammonia	no reaction
Uranous Salt (U)	0.1 per cent

1 Description—Brilliant yellow crystals with a greenish fluorescence.

2 Solubility—Readily soluble in alcohol and in ether. Dissolve 5 g in 50 ml of water, a clear yellow solution should be produced.

3 Chloride—Dissolve 1 g in 50 ml of water and 1 ml of dilute nitric acid and add 1 ml of silver nitrate solution. No opalescence should be produced.

(Continued overleaf)

URANYL NITRATE—continued

4 **Sulphate.**—Dissolve 2 g in 5 ml of water and 1 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

5 **Heavy Metals and Iron.**—Pass hydrogen sulphide for a few seconds through the solution obtained in Test No. 6. Not more than a very faint darkening should be produced.

6 **Calcium.**—Dissolve 1 g in 40 ml of water and 10 ml of ammonium carbonate solution. A clear solution should be produced.

7. **Alkalis and other Metals.**—Dissolve 2 g in 50 ml of water, heat to boiling and add 5 ml of dilute ammonia solution. Filter, evaporate the filtrate to dryness, moisten with sulphuric acid and ignite gently. Not more than 6 mg of residue should be obtained.

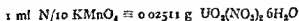
8 **Ammonia.**—Dissolve 1 g in 10 ml of water, add 5 ml of sodium hydroxide solution and boil. No odour of ammonia should be perceptible.

9 **Uranous Salt.**—Dissolve 1 g in 20 ml of water and 5 ml of dilute sulphuric acid and add 0.1 ml of N/10 KMnO_4 . The pink colour should not entirely disappear.

10 **Assay.**—Dissolve 0.9 g in 5 ml of sulphuric acid and heat until white fumes are evolved. Cool, mix with 10 ml of water and reheat to fuming. Repeat this last procedure twice. Cool and dilute to 100 ml. Set up a Jones reductor and reactivate the amalgam by passing a mixture of 40 ml of dilute sulphuric acid and 60 ml of water through the column, followed by 100 ml of water.

(a) *Blank.*—Pass 200 ml of N/1 H_2SO_4 through the column followed by 100 ml of water, bubble air through the contents of the receiver flask for 10 minutes and then titrate with N/10 KMnO_4 .

(b) *Determination.*—Run 100 ml of N/1 H_2SO_4 through the column, followed by the prepared solution then run through 100 ml of N/1 H_2SO_4 , followed by 100 ml of water. Bubble air through the contents of the receiver flask for 10 minutes, titrate with N/10 KMnO_4 and deduct the value of the blank.



Not less than 99 per cent should be indicated.

ANALAR

UREA



Maximum Limits of Impurities

Sulphated Ash	0.05 per cent
Chloride (Cl)	0.0005 per cent
Sulphate (SO_4)	0.005 per cent
Heavy Metals (Pb)	0.0004 per cent
Iron (Fe)	0.0002 per cent

1 **Description.**—White crystals or crystalline powder

2 **Solubility.**—Readily soluble in alcohol. Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained.

3 **Reaction.**—Dissolve 1 g in 20 ml of water. The solution should be neutral to litmus paper.

4 **Melting Point.**— 131° to 133°

5 **Sulphated Ash.**—Moisten 1 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left.

6 **Chloride.**—Dissolve 2 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.

7 **Sulphate.**—Dissolve 2 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced.

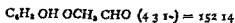
8 **Heavy Metals and Iron.**—Dissolve 5 g in 45 ml of water, add 5 ml of dilute ammonia solution and pass hydrogen sulphide through the solution for a few seconds. Any colour produced should not be deeper than the "standard colours" defined in appendix 2.

9 **Assay.**—Digest 1 g with 10 ml of sulphuric acid in a Kjeldahl flask for two hours. Cool, dilute with water, render alkaline with sodium hydroxide, distil and collect the distillate in 50 ml of $\text{N}/1 \text{ H}_2\text{SO}_4$, and titrate the excess of acid with $\text{N}/1 \text{ NaOH}$ using methyl red as indicator. Carry out a blank determination in the same manner.



Not less than 99.5 per cent should be indicated.

ANALAR VANILLIN



Maximum Limits of Impurities

Alcohol insoluble Matter	nil
Sulphated Ash	0.01 per cent

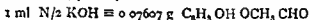
1 **Description**—Colourless or faintly yellow, small acicular crystals with an aromatic odour

2 **Solubility**.—Dissolve 5 g in 50 ml of 90 per cent ethyl alcohol. A clear yellow solution should be produced

3 **Melting Point**.—81° to 82°

4 **Sulphated Ash**—Moisten 5 g with sulphuric acid and ignite gently. Not more than 0.5 mg of residue should be left

5 **Assay**.—Dissolve 3 g in 50 ml of alcohol and titrate with N/2 alcoholic KOH using phenolphthalein as indicator



Not less than 99 per cent should be indicated

ANALAR WATER (Redistilled)



Maximum Limits of Impurities

Non volatile Matter	5 parts per million
Chloride (Cl)	0.1 part per million
Sulphate (SO ₄)	1 part per million
Nitrate (NO ₃)	0.2 part per million
Lead (Pb)	0.05 part per million
Copper (Cu)	0.02 part per million
Iron (Fe)	0.05 part per million
Manganese (Mn)	0.4 part per million
Nickel (Ni)	0.2 part per million
Cobalt (Co)	0.5 part per million
Zinc (Zn)	0.2 part per million
Calcium (Ca)	2 parts per million
Ammonia (NH ₃)	0.02 part per million
Oxygen absorbed (O)	0.08 part per million

1. **Description**.—A clear colourless odourless liquid

2 Reaction.—To 0.2 ml of indicator solution (bromothymol blue or bromocresol purple), previously adjusted to the mid-point of its pH range and contained in a Nessler glass, add 50 ml of the water and compare the colour in similar Nessler glasses with standard buffer solutions containing the same proportions of indicator, viewing down the length of the Nessler glasses against a white tile. The pH value should not be lower than 5.5 and not higher than 7.5. A wide tolerance for the reaction of 'ANALAR' water is allowed because of the readiness with which water absorbs carbon dioxide.

3 Non-volatile Matter and Calcium.—Evaporate 100 ml to dryness on a water-bath. Not more than 0.5 mg of residue should be left.

4 Chloride.—To 60 ml add 0.1 ml of N/1 Na_2CO_3 and evaporate until reduced to 10 ml. Transfer to a test-tube, add 0.2 ml N/1 HNO_3 and 0.1 ml of silver nitrate solution. Any opalescence produced should not exceed that given by adding 0.1 ml of silver nitrate solution to 10 ml of the same water containing 0.1 ml of N/1 Na_2CO_3 , 0.2 ml N/1 HNO_3 and 0.05 ml of standard chloride solution (1 ml = 0.1 mg Cl).

5 Sulphate.—To 50 ml add 0.5 ml of dilute hydrochloric acid and 5 ml of barium chloride solution and allow to stand for 15 minutes. No turbidity should be produced.

6 Nitrate.—To 2.5 ml add 1.5 ml of diphenylbenzidine reagent and 6 ml of nitrogen free sulphuric acid. On mixing no blue colour should be produced.

7 Metals.—(a) To 50 ml contained in a Nessler glass add 1 ml of dilute ammonia solution and 1 ml of a 1 per cent aqueous solution of sodium diethyldithiocarbamate. No colour or turbidity should be produced.

(b) Shake vigorously 25 ml in a stoppered test-tube of lead-free glass with 0.1 ml of potassium cyanide solution and 25 ml of a 0.001 per cent w/v solution of diphenylthiocarbazone in carbon tetrachloride and allow to separate. The lower layer should not be red or pink.

(c) To 50 ml add 1 ml of glacial acetic acid and 3 ml of strong ammonia solution and pass hydrogen sulphide through the solution for a few seconds. No colour should be produced.

8 Ammonia.—To 50 ml add 2 ml of Nessler's reagent, mix and allow to stand for 15 minutes. No yellow colour should be produced.

9 Oxygen Absorption.—To 500 ml add 1 ml of dilute sulphuric acid and 0.05 ml of N/10 KMnO_4 and heat to boiling. The pink colour should not entirely disappear.

ANALAR

ZINC

Zn = 65.38

Maximum Limits of Impurities

Acid insoluble Matter	passes test
Iron (Fe)	0.002 per cent
Oxidisable Impurities (O)	0.0008 per cent
Arsenic (As_2O_3)	0.00001 per cent (0.1 part per million)

Sensitivity in arsenic test passes test

1 **Description**—A bright silver grey metal in granulated form, or as pellets shot or sticks

2 **Acid-insoluble Matter**.—Dissolve 5 g. in 20 ml. of hydrochloric acid diluted with 20 ml. of water. A clear colourless solution free from more than traces of insoluble matter should be obtained

3 **Iron**.—Dissolve 0.5 g. in 4 ml. of dilute hydrochloric acid add 7 ml. of water and 1 drop of N/10 KMnO_4 , mix add 5 ml. of ammonium thiocyanate solution and 10 ml. of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml. of standard iron solution (1 ml. = 0.01 mg. Fe) in the same manner

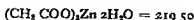
4 **Oxidisable Impurities**.—Dissolve 10 g. in 50 ml. of water and 15 ml. of sulphuric acid in a flask from which air is excluded, when solution is complete, add 0.1 ml. of N/10 KMnO_4 . The pink colour should persist for at least 5 minutes

5 **Arsenic**.—Test as described in appendix 4 using 20 g. of the sample, 50 ml. of hydrochloric acid 0.5 ml. of stannous chloride solution and 250 ml. of water and allow the reaction to proceed for 1 hour. Any stain produced should not be greater than a 0.002 mg. standard stain

6 **Sensitivity**—Carry out the procedure for the production of 0.001 mg. and 0.01 mg. standard arsenic stains described in appendix 4. A faint yellow stain should be produced in the former case, and a normal stain in the latter case

ANALAR

ZINC ACETATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Sulphate (SO_4)	0.01 per cent
Lead (Pb)	0.004 per cent
Iron (Fe)	0.0005 per cent
Arsenic (As_2O_3)	0.0005 per cent (5 parts per million)
Sodium (Na)	0.006 per cent
Other Metals	passes test

1 Description.—Colourless or white crystals with a faint odour of acetic acid

2 Solubility.—Dissolve 5 g in 50 ml of water. A clear colourless solution should be obtained

3 Chloride.—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced

4 Sulphate.—Dissolve 1 g in 50 ml of water, add 1 ml of dilute hydrochloric acid and 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 Lead.—Dissolve 0.5 g in 10 ml of water and 5 ml of dilute acetic acid, add 20 ml of zinc ammonium acetate solution, 10 ml of dilute ammonia solution and 1 ml of potassium cyanide solution, mix, and add 5 ml of hydrogen sulphide solution (one-tenth saturated). Any colour produced should not be deeper than that produced by the addition of 5 ml of the same hydrogen sulphide solution to 45 ml of solution containing 2 ml of standard lead solution (1 ml = 0.01 mg Pb) and the quantities of reagents used in the test

6 Iron.—Dissolve 2 g in 7 ml of water and add 4 ml of dilute hydrochloric acid and 1 drop N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml standard iron solution (1 ml = 0.01 mg Fe) in the same manner

7 Arsenic.—Dissolve 2 g in 12 ml of brominated hydrochloric acid and 50 ml of water, add a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

(Continued overleaf)

ZINC ACETATE—continued

8 **Sodium**—Dissolve 2.5 g in 3 ml of uranyl acetate solution* and 7 ml of water, add 10 ml of alcohol and allow to stand for 1 hour. No turbidity or precipitate should be produced.

9 **Other Metals**—Dissolve 2 g in 100 ml of water, add 15 ml of dilute ammonia solution and allow to stand for 30 minutes. The solution should remain clear and colourless.

10 **Assay**—Dissolve 1 g in 10 ml of water, add 25 ml of sodium hydroxide solution and stir until the solution clears. Dilute to 150 ml with water and electrolyse the solution for 1 hour with a current of 3 amperes, using a weighed copper plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.

$$\text{Weight of Zn} \times 3.357 = \text{weight of } (\text{CH}_3\text{COO})_2\text{Zn} \cdot 2\text{H}_2\text{O}$$

Not less than 99 per cent and not more than 102 per cent should be indicated.

ANALAR ZINC OXIDE



Maximum Limits of Impurities

Acid insoluble Matter	nil
Chloride (Cl)	0.002 per cent
Sulphate (SO ₄)	0.01 per cent
Carbonate	passes test
Metallic Zinc	passes test
Lead (Pb)	0.01 per cent
Iron (Fe)	0.0005 per cent
Oxidisable Matter (O)	0.002 per cent
Arsenic (As ₂ O ₃)	0.0005 per cent
	(5 parts per million)

1 **Description**.—A white amorphous powder.

2 **Solubility**—Insoluble in water. Dissolve 5 g in 40 ml of dilute hydrochloric acid and 10 ml of water, a clear colourless solution should be produced.

3 **Chloride**—Dissolve 5 g in 30 ml of dilute nitric acid and 20 ml of water and add 1 ml of silver nitrate solution. Any opalescence produced should not be greater than the "standard opalescence" defined in appendix 2.

* Dissolve 0.5 g of uranyl acetate AnalaR in 10 ml of water heat to boiling and add 1.5 ml of dilute ammonia solution. Filter wash the precipitate with hot water and dissolve in 3 ml of dilute acetic acid.

4 **Sulphate.**—Dissolve 1 g in 45 ml of water and 6 ml of dilute hydrochloric acid, add 1 ml of barium chloride solution and allow to stand for 1 hour. No turbidity or precipitate should be produced

5 **Carbonate and Metallic Zinc.**—Dissolve 5 g in 50 ml of dilute hydrochloric acid containing 1 drop of lead acetate solution. No effervescence should take place and the resulting solution should be clear and free from any black particles

6 **Lead.**—Dissolve 0.5 g in 10 ml of water and 5 ml of dilute acetic acid, add 20 ml of zinc ammonium acetate solution, 10 ml of dilute ammonia solution and 1 ml of potassium cyanide solution, mix and add 5 ml of hydrogen sulphide solution (one-tenth saturated). Any colour produced should not be deeper than that produced by the addition of 5 ml of the same hydrogen sulphide solution to 45 ml of solution containing 5 ml of standard lead solution (1 ml = 0.01 mg Pb) and the quantities of reagents used in the test

7 **Iron.**—Dissolve 1 g in 6 ml of dilute hydrochloric acid and 5 ml of water and add 1 drop of N/10 KMnO_4 , mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0.5 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner

8 **Oxidisable Matter.**—Triturate 5 g with 30 ml of water and 0.25 g of ferric ammonium sulphate. Add 75 ml of water and 5 ml of sulphuric acid, warm to dissolve if necessary. Cool and add 0.15 ml of N/10 KMnO_4 . The pink colour should persist for 15 minutes

9 **Arsenic.**—Dissolve 2 g in 12 ml of brominated hydrochloric acid and 50 ml of water, add a few drops of stannous chloride solution and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain

10 **Assay.**—Dissolve 0.2 g of the freshly ignited material in 5 ml of dilute sulphuric acid and 10 ml of water. Add 25 ml of sodium hydroxide solution and stir until the solution clears. Dilute to 150 ml with water and electrolyse the solution for 1 hour with a current of 3 amperes, using a weighed copper-plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh

$$\text{Weight of Zn} \times 1.2447 = \text{weight of ZnO}$$

Not less than 99.5 per cent. should be indicated.

ANALAR ZINC POWDER

$$\text{Zn} = 65.38$$

Maximum Limits of Impurities

Acid insoluble Matter	passes test
Iron (Fe)	0.004 per cent
Oxidisable Impurities (O)	0.0008 per cent
Nitrogen (N)	0.02 per cent

1 **Description**—A fine grey powder free from all but small aggregates

2-4 **Tests for Acid-insoluble Matter, Iron and Oxidisable Impurities** are carried out as described for Zinc, except that in Test 3 (Iron) 0.25 g should be used

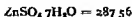
5 **Nitrogen**—Treat 2 g with 100 ml of sodium hydroxide solution in an ammonia distillation apparatus and distil 50 ml, collecting the distillate in 25 ml of N/100 H_2SO_4 . Titrate the excess of acid with N/100 NaOH, using methyl red as indicator. Carry out a blank determination in the same manner. The difference between the two titrations should not exceed 3.0 ml

6 **Assay**—Shake 1 g with 25 g of ferrous ammonium sulphate and 100 ml of water in a vessel from which the air has been displaced by carbon dioxide, until the zinc is completely dissolved. Add 50 ml of dilute sulphuric acid dilute to 500 ml with water, and titrate 50 ml of this solution with N/10 KMnO_4

$$1 \text{ ml N/10 KMnO}_4 = 0.003269 \text{ g Zn}$$

Not less than 95 per cent should be indicated

ANALAR ZINC SULPHATE



Maximum Limits of Impurities

Chloride (Cl)	0.001 per cent
Nitrate (NO_3)	0.001 per cent
Heavy Metals (Pb)	0.001 per cent
Iron (Fe)	0.002 per cent
Ammonia (NH_3)	0.001 per cent
Arsenic (As_2O_3)	0.0001 per cent
	(1 part per million)

- 1 **Description.**—Colourless crystals
- 2 **Solubility.**—Dissolve 5 g in 50 ml of water. A clear colourless solution should be produced.
- 3 **Reaction.**—A 10 per cent aqueous solution should be neutral to methyl red.
- 4 **Chloride.**—Dissolve 1 g in 50 ml of water and add 1 ml of dilute nitric acid and 1 ml of silver nitrate solution. No opalescence should be produced.
- 5 **Nitrate.**—Dissolve 2 g in 10 ml of water, add 1 ml of standard indigo solution and 10 ml of sulphuric acid and heat to boiling. The blue colour should not entirely disappear.
- 6 **Heavy Metals.**—Dissolve 1 g in 30 ml of water, acidify with 5 ml of dilute acetic acid, render alkaline with 10 ml of dilute ammonia solution and add 5 ml of hydrogen sulphide solution (one-tenth saturated). No immediate darkening should be produced.
- 7 **Iron.**—Dissolve 0.5 g in 10 ml of water and add 1 ml of dilute hydrochloric acid and 1 drop of $N/10$ $KMnO_4$, mix, add 5 ml of ammonium thiocyanate solution and 10 ml of a mixture of equal volumes of amyl alcohol and amyl acetate, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 1 ml of standard iron solution (1 ml = 0.01 mg Fe) in the same manner.
- 8 **Ammonia.**—Dissolve 1 g in 45 ml of water, add 5 ml of sodium hydroxide solution and 2 ml of Nessler's reagent. Any colour produced should not exceed that given by the addition of 5 ml of sodium hydroxide solution and 2 ml of Nessler's reagent to 45 ml of water containing 1 ml of standard ammonia solution (1 ml = 0.01 mg NH_3).
- 9 **Arsenic.**—Dissolve 10 g in 50 ml of water, add 10 ml of stannated hydrochloric acid and test as described in appendix 4. Any stain produced should not be greater than a 0.01 mg standard stain.
- 10 **Assay.**—Dissolve 1 g in 10 ml of water, add 25 ml of sodium hydroxide solution and stir until the solution clears. Dilute to 150 ml with water and electrolyse the solution for 1 hour with a current of 3 amperes, using a weighed copper-plated platinum cathode, as described in appendix 5. Wash the cathode with water, then with acetone, dry and weigh.
$$\text{Weight of Zn} \times 4.398 = \text{weight of } ZnSO_4 \cdot 7H_2O$$

Not less than 99.0 per cent, and not more than 100.5 per cent, should be indicated.

APPENDIX 1

(a) REAGENTS USED IN TESTING 'ANALAR' CHEMICALS

The chemicals and the water employed in the preparation of the following reagent solutions should comply with the requirements of the 'ANALAR' specifications, where such are available. The quantities used for the solutions of solid salts refer to the salt in the state of hydration prescribed in these specifications.

ACETIC ACID, DILUTE (approximately 5N)

Acetic acid glacial	285 ml
Water	to produce 1000 ml

ALCOHOL

Ethyl alcohol (90 per cent)

AMMONIA SOLUTION, STRONG (approximately 18N)

Ammonia solution ANALAR' (sp gr 0.880)

AMMONIA SOLUTION DILUTE (approximately 5N)

Ammonia solution strong	280 ml
Water	to produce 1000 ml

AMMONIUM ACETATE SOLUTION (approximately 1M)

77 g per litre

AMMONIUM CARBONATE SOLUTION (approximately 5N)

Ammonium carbonate	200 g
Ammonia solution dilute	250 ml
Water	to produce 1000 ml

AMMONIUM CHLORIDE SOLUTION (approximately 2M)

107 g per litre

AMMONIUM NITRO MOLYBDATE SOLUTION

Molybdic acid	125 g
Ammonia solution, strong	75 ml
Water	325 ml

Dissolve and add

Ammonium nitrate	400 g
Water	to produce 1000 ml

then add a mixture of

Nitric acid	380 ml
Water	620 ml

Allow to stand at 35° for 24 hours and filter

AMMONIUM OXALATE SOLUTION (approximately 0.25 M)

35 g per litre

AMMONIUM PHOSPHATE SOLUTION (approximately 1M)

132 g per litre

AMMONIUM THIOCYANATE SOLUTION (approximately 7.5M)

570 g per litre

BARIUM CHLORIDE SOLUTION (approximately 0.5M)

122 g per litre

BARIUM NITRATE SOLUTION (approximately 0.25M)

65 g per litre

BROMINATED HYDROCHLORIC ACID

Bromine solution 10 ml

Hydrochloric acid to produce 1000 ml

BROMINE SOLUTION

Bromine 100 ml

Potassium bromide 300 g

Water to produce 1000 ml

CADMIUM IODIDE SOLUTION (approximately 0.25M)

92 g per litre

CALCIUM CHLORIDE SOLUTION (approximately 0.5M)

110 g per litre

CALCIUM SULPHATE SOLUTION

A saturated aqueous solution

CUPRIC SULPHATE SOLUTION (approximately 0.5M)

125 g per litre

DIPHENYLAMINE REAGENT

Diphenylamine 80 mg

Water 20 ml

Sulphuric acid (nitrogen free) 60 ml

DIPHENYLBENZIDINE REAGENT

Diphenylbenzidine 8 mg

Water 5 ml

Sulphuric acid (nitrogen free) 45 ml

FEHLING'S SOLUTION

No. 1 Cupric sulphate 34.64 g

Sulphuric acid 0.5 ml

Water to produce 500 ml

No. 2 Sodium potassium tartrate 176 g

Sodium hydroxide 77 g

Water to produce 500 ml

FERRIC AMMONIUM SULPHATE SOLUTION (approximately 0.2M)

96 g per litre

FERRIC CHLORIDE SOLUTION (approximately 0.33M)

90 g of ferric chloride (hydrated) per litre

HYDROCHLORIC ACID (approximately 11N)

Hydrochloric acid 'ANALAR' (sp. gr. 1.18)

HYDROCHLORIC ACID, 20 PER CENT.

Hydrochloric acid (sp gr. 1.18)	100 ml
Water	90 ml

HYDROCHLORIC ACID, DILUTE (approximately 5N)

Hydrochloric acid (sp gr 1.18)	430 ml
Water	to produce 1000 ml

HYDROXYLAMINE HYDROCHLORIDE REAGENT

Hydroxylamine hydrochloride	10 g
Ethyl alcohol (90 per cent)	500 ml
Bromophenol blue solution	10 ml
Water	to produce 1000 ml

Dissolve and add sufficient N/10 NaOH to produce a greenish colour

LEAD ACETATE SOLUTION (approximately 0.25M)

95 g per litre

NESSLER'S REAGENT

Potassium iodide	35 g
Mercuric chloride	12.5 g
Water	800 ml

Dissolve and add a cold saturated solution of mercuric chloride until a slight permanent precipitate is produced, then add

Sodium hydroxide	120 g
------------------	-------

Dissolve, add a little more mercuric chloride solution and sufficient water to produce 1000 ml

Shake occasionally for several days, allow to settle and decant the clear liquid for use

NIOXIME SOLUTION

A saturated (about 0.85 per cent) solution of 1,2-cyclohexanedione dioxime in water

NITRIC ACID (approximately 16N)

Nitric acid 'ANALAR' (sp gr 1.42)

NITRIC ACID, DILUTE (approximately 5N)

Nitric acid (sp gr 1.42)	320 ml
Water	to produce 1000 ml

m PHENYLENEDIAMINE SULPHATE SOLUTION

2.5 g per litre

PHOSPHATE REAGENT

No. 1 Ammonium molybdate (powdered)	5 g
N/1 Sulphuric acid	100 ml
Dissolve with it heat	

No. 2 *N*-Methyl-*p*-aminophenol sulphate

(Metol)	0.2 g
Sodium metabisulphite	20 g
Water	100 ml

Dissolve without heat

POTASSIUM CHROMATE SOLUTION (approximately 0.25M)

49 g per litre

POTASSIUM CYANIDE SOLUTION (approximately 1.5M)

100 g per litre

POTASSIUM FERRICYANIDE SOLUTION

A 1 per cent aqueous solution, freshly prepared, from crystals previously rinsed with water

POTASSIUM FERROCYANIDE SOLUTION (approximately 0.1M)

42 g per litre

POTASSIUM IODIDE SOLUTION (approximately 1M)

166 g per litre

POTASSIUM PLUMBITE SOLUTION

Lead acetate	17 g
Potassium citrate	34 g
Potassium hydroxide	50 g
Water	to produce 100 ml

SCHIFF'S REAGENT

Magenta	1 g
Water	600 ml

Dissolve, cool in an ice-bath and add 20 g of sodium sulphite dissolved in 100 ml of water. Cool again in an ice-bath and slowly add 9 ml of hydrochloric acid with stirring. Dilute to 1 litre. If the solution is turbid, filter. If it has a brown colour add a little decolorising charcoal and filter immediately. A slight residual red colour may be destroyed by the addition of 2 to 3 ml more of hydrochloric acid. Allow the completed solution to stand overnight before use.

SILVER NITRATE SOLUTION (approximately 0.25M)

42 g per litre

SODIUM HYDROXIDE SOLUTION (approximately 5N)

200 g per litre

SODIUM SULPHIDE SOLUTION (approximately 0.5M)

120 g per litre

STANNATED HYDROCHLORIC ACID

Stannous chloride solution	10 ml
Hydrochloric acid	to produce 1000 ml

STANNOUS CHLORIDE SOLUTION

Stannous chloride	330 g
Hydrochloric acid	100 ml
Water	to produce 1000 ml

SULPHURIC ACID (approximately 36N)

Sulphuric acid 'ANALAR'

SULPHURIC ACID, DILUTE (approximately 5N)

Sulphuric acid	136 ml
Water	to produce 1000 ml

ZINC AMMONIUM ACETATE SOLUTION

Zinc oxide	100 g
Acetic acid, glacial	200 ml
Water	300 ml

Dissolve and add

Ammonia solution strong	300 ml
Water	to produce 1000 ml

then add 5 ml of sodium sulphide solution, digest on a water bath for several hours and filter through filter paper pulp

(b) INDICATOR SOLUTIONS***BROMOCRESOL GREEN pH 3.6-5.2**

Warm 0.1 g with 2.9 ml of N/20 NaOH and 5 ml of alcohol until dissolved, dilute with 20 per cent alcohol to produce 250 ml

BROMOCRESOL PURPLE pH 5.2-6.8

Warm 0.1 g with 5 ml of alcohol until dissolved, dilute with 100 ml of 20 per cent alcohol, add 3.7 ml of N/20 NaOH and sufficient 20 per cent alcohol to produce 250 ml

BROMOPHENOL BLUE pH 2.8-4.6

Warm 0.1 g with 3.0 ml of N/20 NaOH and 5 ml of alcohol until dissolved, dilute with 20 per cent alcohol to produce 250 ml

BROMOTHYMOLO BLUE pH 6.0-7.6

Warm 0.1 g with 3.2 ml of N/20 NaOH and 5 ml of alcohol until dissolved, dilute with 20 per cent alcohol to produce 250 ml

DIMETHYL YELLOW pH 2.8-4.6

Dissolve 0.2 g in 100 ml of 90 per cent alcohol

METHYL ORANGE pH 2.8-4.6

Dissolve 0.04 g in 100 ml of 20 per cent alcohol

METHYL RED pH 4.2-6.3

Warm 0.025 g with 0.95 ml of N/20 NaOH and 5 ml of alcohol until dissolved, dilute with 50 per cent alcohol to produce 250 ml

* Industrial alcohol may be used for preparing these solutions which are in accordance with the formulae given in the British Pharmacopoeia 1948

***o* PHENANTHROLINE FERROUS COMPLEX**

Dissolve 0.7 g of ferrous sulphate in 70 ml of water add 1.5 g of *o* phenanthroline and dilute with water to 100 ml

PHENOLPHTHALEIN pH 8.3-10.0

Dissolve 0.2 g in 60 ml of 90 per cent alcohol and add 40 ml of water

PHENOL RED pH 6.8-8.4

Warm 0.05 g with 2.85 ml of N/20 NaOH and 5 ml of alcohol until dissolved dilute with 20 per cent alcohol to produce 250 ml

STARCH

Mix 0.5 g of soluble starch with 5 ml of cold water, add with constant stirring 95 ml of boiling water and heat in a boiling water bath for 5 minutes

THYMOL BLUE pH 8.0-9.6

Warm 0.1 g with 4.3 ml of N/20 NaOH and 5 ml of alcohol until dissolved dilute with 20 per cent alcohol to produce 250 ml

THYMOLPHTHALEIN pH 9.3-10.5

Dissolve 0.2 g in 60 ml of 90 per cent alcohol and add 40 ml of water

***o* TOLIDINE**

Dissolve 0.1 g of *o* tolidine in 10 ml of hydrochloric acid and dilute with water to 100 ml

(c) STANDARD SOLUTIONS**ALUMINIUM 1 ml = 0.1 mg Al**

Ammonium alum	1.68 g
Water	to produce 1000 ml

AMMONIA 1 ml = 0.01 mg NH₃

Ammonium chloride	3.15 g
Water	to produce 1000 ml

Dilute this solution one hundred times with water immediately before use

ARSENIC 1 ml = 0.01 mg As₂O₃

Arsenous oxide	1.00 g
Hydrochloric acid	50 ml
Water	to produce 1000 ml

Dilute this solution one hundred times with water immediately before use

BISMUTH 1 ml = 0.01 mg Bi

Dissolve 0.10 g of finely powdered bismuth in 25 ml of hot sulphuric acid cool and dilute with water to produce 1000 ml

Dilute this solution ten times with water immediately before use

BROMIDE BROMATE N/10

Potassium bromide	25 g
Potassium bromate (finely powdered and dried at 110° for 1 hour)	2.784 g
Water	to produce 1000 ml

CHLORIDE 1 ml = 0.1 mg Cl

N/10 Hydrochloric acid	28.2 ml
Water	to produce 1000 ml

COBALT 1 ml = 0.01 mg Co

Cobalt chloride	4.05 g
Hydrochloric acid	50 ml
Water	to produce 1000 ml

Dilute this solution one hundred times with water immediately before use

COPPER 1 ml = 1 mg Cu

Cupric sulphate	3.93 g
Sulphuric acid	50 ml
Water	to produce 1000 ml

COPPER 1 ml = 0.01 mg Cu

Dilute standard copper solution (1 ml = 1 mg Cu) one hundred times with water immediately before use

INDIGO 1 ml = 0.02 mg NO₂

Dissolve 0.2 g of indigo carmine in 500 ml of dilute sulphuric acid, add 20 ml of hydrochloric acid and sufficient dilute sulphuric acid to produce 1000 ml. Standardise the solution so that 10 ml added to 3.3 ml of M/1000 KNO₃ is just decolorised on adding 13 ml of sulphuric acid and heating to boiling.

IRON 1 ml = 0.01 mg Fe (ic)

Ferric ammonium sulphate	8.65 g
Nitric acid	50 ml
Water	to produce 1000 ml

Dilute this solution one hundred times with water immediately before use

LEAD 1 ml = 1 mg Pb

Lead nitrate	1.60 g
Nitric acid	50 ml
Water	to produce 1000 ml

LEAD 1 ml = 0.01 mg Pb

Dilute standard lead solution (1 ml = 1 mg Pb) one hundred times with water immediately before use

MAGNESIUM 1 ml = 0.1 mg Mg

Magnesium sulphate	1.00 g
Dilute sulphuric acid	5 ml
Water	to produce 1000 ml

PHOSPHATE 1 ml = 0.01 mg PO_4

Potassium dihydrogen phosphate	1.43 g
Water	to produce 1000 ml

Store in a waxed bottle

Dilute this solution one hundred times with water immediately before use

SULPHATE 1 ml = 0.1 mg SO_4

N/10 Sulphuric acid	20.8 ml
Water	to produce 1000 ml

ZINC 1 ml = 1 mg Zn

Dissolve 1.00 g of zinc in a slight excess of hydrochloric acid and dilute with water to 1000 ml

ZINC 1 ml = 0.01 mg Zn

Dilute standard zinc solution (1 ml = 1 mg Zn) one hundred times with water immediately before use

ZINC AMMONIUM CHLORIDE M/10

Dissolve 6.538 g of zinc in a slight excess of hydrochloric acid, add 5 g of ammonium chloride render alkaline with ammonia and dilute with water to produce 1000 ml

APPENDIX 2

PRÉPARATION OF STANDARD COMPARISON SOLUTIONS

Standard Opalescence

To 50 ml of water add 1 ml of standard chloride solution (1 ml = 0.1 mg Cl) 1 ml of dilute nitric acid and 1 ml of silver nitrate solution Mix and use as a comparison standard after 5 minutes

Standard Turbidity

To 8 ml of water add 2 ml of standard sulphate solution (1 ml = 0.1 mg SO_4), 0.2 ml of N/1 Na_2CO_3 , 1.2 ml of N/1 HCl and 1 ml of barium chloride solution Mix and use as a comparison standard after 5 minutes

Standard Colours for Heavy Metals and Iron

(a) Mix 2 ml of standard lead solution (1 ml = 0.01 mg Pb) with 1 ml of glacial acetic acid, 10 ml of dilute ammonia solution and sufficient water to produce 50 ml, then pass hydrogen sulphide through the solution for a few seconds

(b) Mix 1 ml of standard iron solution (1 ml = 0.01 mg Fe) with 1 ml of glacial acetic acid, 10 ml of dilute ammonia solution and sufficient water to produce 50 ml, then pass hydrogen sulphide through the solution for a few seconds

The Standard Colour is (1) that of solution (a) or (2) that of solution (b) or (3) that of 50 ml of any mixture of these two solutions

The solutions are conveniently viewed in Nessler glasses against a white background

Standard Colour for Phosphate

Mix 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) with 20 ml of water, 3 ml of dilute sulphuric acid, 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water-bath at 60° for 10 minutes.

Standard Colour for Silicate

Mix 1 ml of standard phosphate solution (1 ml = 0.01 mg PO_4) with 20 ml of water, 1 ml of dilute sulphuric acid 1 ml of phosphate reagent No 1 and 1 ml of phosphate reagent No 2 and place in a water-bath at 60° for 10 minutes. The blue colour obtained is of the same intensity as that yielded by 0.005 mg of SiO_2 when similarly treated

APPENDIX 3

THE LIMIT TEST FOR WATER

Karl Fischer Reagent

Forty-five grams of dry iodine are added to an anhydrous mixture of 250 ml of methyl alcohol and 80 ml of pyridine contained in a dry gas wash bottle, the delivery tube being fitted with a screw clip and the exit limb connected to an efficient drying tube. The mixture is gassed with dry sulphur dioxide until 20–22 g has dissolved. The reagent should be stored under moisture free conditions and should be standardised by titration against a standard solution of water in methyl alcohol. Karl Fischer reagent prepared as described above will initially have a water equivalent of about 5 mg per ml, but it should be re-standardised at frequent intervals as, apart from its extreme sensitivity to moisture, it undergoes slow but continual autodecomposition.

Titration with Karl Fischer Reagent

The titration is carried out in a vessel completely protected from atmospheric moisture and provided with a mechanical stirrer. The end point is detected by the use of a potentiometric circuit employing a polarised pair of bright platinum electrodes.

APPENDIX 4

THE LIMIT TEST FOR ARSENIC

The apparatus consists essentially of a glass tube, 200 millimetres long with an internal diameter of 6.5 millimetres, the upper end is cut off square and ground smooth, while the lower end is drawn out to a diameter of about 1 millimetre, and a hole about 2 millimetres in diameter is blown in the side of the tube where it is constricted.

The tube is fitted by means of a rubber bung into a wide mouthed bottle of about 120 ml. capacity in such a manner that the hole in the side of the tube is clear of the underside of the bung and the end of the drawn out portion is clear above the surface of the liquid in the bottle.

Alternatively, a conical flask may be used in place of the wide mouthed bottle, and the tube may be fitted with a ground glass joint in place of the rubber bung.

A piece of white filter paper, 100 × 50 millimetres, which has been soaked in a 10 per cent aqueous solution of lead acetate and dried, is rolled up and placed in the tube so that the upper portion is about 25 millimetres below the top of the tube. The function of the lead paper is to absorb traces of hydrogen sulphide from the issuing gases.

A piece of white filter paper, previously soaked in a saturated aqueous solution of mercuric chloride, pressed to remove superfluous fluid, and dried, is placed over the upper end of the tube and held in position in such a manner that the whole of the issuing gas passes through a circle of paper 6.5 millimetres in diameter.

Method of Performing the Test

A weighed quantity of the substance is dissolved in 50 ml. of water and 10 ml. (or the specified amount) of stannated hydrochloric acid is added. This is placed in the wide mouthed bottle (or flask), 10 g. of granulated zinc is added and the glass tube containing the lead paper and fitted with the mercuric chloride paper is placed in position. The apparatus is allowed to stand in a warm place, such as on a hot plate, so that a steady but not too vigorous evolution of gas is obtained. A temperature of from 40° to 60° is usually suitable. The reaction is allowed to proceed for about 40 minutes, care being taken that the mercuric chloride paper is not exposed to bright sunlight.

The stain produced on the mercuric chloride paper is compared with stains produced in the same manner from known quantities of arsenic. The most useful standards for comparison are those produced by quantities of arsenic ranging from 0.001 mg to 0.01 mg of As_2O_3 . These standard stains are obtained by carrying out the test using 50 ml of water, 10 ml of stannated hydrochloric acid and quantities varying from 0.1 ml to 1.0 ml of standard arsenic solution (1 ml = 0.01 mg As_2O_3). These stains fade on keeping and freshly prepared standards only should be used.

If the substance to be tested is insoluble in water, but soluble in hydrochloric acid, it is dissolved in sufficient stannated hydrochloric acid to leave an excess of 10 ml for reacting with the zinc, and the test is then carried out in the usual manner. If the substance is strongly alkaline and a vigorous reaction takes place on addition of acid, brominated hydrochloric acid is used to prevent any loss of arsenic, and the bromine is finally removed by the addition of a few drops of stannous chloride solution. Where special treatment is necessary, full details are given in the text.

Fresh lead paper should be used for each test, and the tubes must be kept dry and scrupulously clean. The mercuric chloride papers should be carefully preserved in a well stoppered bottle and protected from light and from ammonia.

APPENDIX 5

ELECTRODEPOSITION OF METALS

Apparatus

The electrodes employed should be of the concentric cylindrical platinum gauze or similar type, suitable for rapid electrolysis with stirring.

Protective Plating

For protective plating of the cathode, the following solution should be used. Dissolve 0.5 g of cupric sulphate in 150 ml of water, add a few drops of sulphuric acid and a few drops of nitric acid and pass a current of 2 amperes for about 1 minute, stirring as usual.

" ANALOIDS "

By the courtesy of Messrs Ridsdale & Co, Analytical and Consulting Chemists, Middlesbrough, the owners of the trademark "Analoid", the word 'Analoid' has been registered as a distinctive name for the Analytical Reagents prepared and issued by The British Drug Houses Ltd and Hopkin & Williams Ltd

The term "Analoid" was registered by Mr C H Ridsdale, F.I.C., a Director of Messrs Ridsdale & Co, in connection with a system of analysis patented by him in 1906. This system had for its object the attainment of a higher degree of accuracy in the routine analysis of iron, steel and other metals, and at the same time a reduction in the time required for the analysis.

The main features of the Analoid system are —

(1) The substitution of various operations, involving filtration and neutralisation, by a simpler technique in which compressed tablets of certain chemical reagents (termed "Analoids") of stated composition are used.

(2) The standardisation of the operations in such a manner as to ensure uniformity of procedure and increased accuracy.

The advantage of the Analoid system is the ease and rapidity with which a large number of analyses of various types of material may be carried out under fixed conditions, such as the addition of exact quantities of reagents, the controlling of the degree of acidity and temperature, and the limitation of the volume of liquid and the period of the reaction. Specially constructed apparatus is used in certain cases and this contributes to the simplification of the tests. The operations are based throughout on practical experience and mature judgment.

The purity of the chemicals used in the manufacture of Analoids is controlled by analysis before and after compression into tablet form in order to ensure that they are suitable for the particular purposes for which they are prepared.

Various technical papers on the subject have been read before numerous societies and the following methods of analysis have been adapted to the Analoid system —

(a) The determination of silicon in iron, steel and aluminium alloys.

(b) The determination of phosphorus in iron, steel, basic slag, phosphor bronze, mineral phosphates, etc.

(c) The determination of manganese in iron, steel, slags, aluminium alloys, ferro-manganese, manganese bronze and ores.

(d) The determination of nickel, chromium, vanadium and molybdenum in iron, steel and ferro alloys.

(e) The determination of copper in commercial copper, brass, bronze, etc.

(f) The determination of lime in commercial lime, limestone cement, blast furnace, open hearth and cupola slags

(g) The determination of the tin coating on tin plate and the zinc coating on galvanised sheets

(h) The determination of iron in non-ferrous materials, slags, iron ores, limestone, &c

(i) The determination of Ni, Si, Cu, Mn, Fe and Ti in aluminium alloys

Four million Analoids are used annually in about 600 metallurgical laboratories in Great Britain and abroad

BIBLIOGRAPHY

Journal Iron & Steel Inst, 1911, Vol I, p 332

Proceedings of the Cleveland Institution of Engineers, Session 1911-12, No 4

Proceedings of the Sheffield Society of Engineers & Metallurgists, Part II, 1912

Proceedings of the Staffordshire Iron & Steel Institute, Session 1912-13

Proceedings of the West of Scotland Iron & Steel Institute, Session 1911-12

Proceedings of the Iron & Steel Institute, 1913, Vol I, p 437

Proceedings of the Cleveland Institution of Engineers, Feb, 1919

Proceedings of the Cleveland Institution of Engineers, Feb, 1920

Chemical News, 7th May, 1920, and 23rd June, 1922

Proceedings of the Iron & Steel Institute, 1926, Vol I, p 463

Photo Electric Methods of Metallurgical Analysis by Haywood and Wood, published by Adam Hdger, Ltd, London

Analoid System of Analysis (1937) by N D Ridsdale, free on request from Ridsdale & Co Ltd 234 Marton Road, Middlesbrough, Yorks

INTERNATIONAL ATOMIC WEIGHTS (1947)

	Symbol	Atomic Weight		Symbol	Atomic Weight
Aluminium	Al	26.97	Molybdenum	Mo	95.95
Antimony	Sb	121.76	Neodymium	Nd	144.27
Argon	A	39.944	Neon	Ne	20.183
Arsenic	As	74.91	Nickel	Ni	58.69
Barium	Ba	137.36	Nitrogen	N	14.008
Beryllium	Be	9.02	Osmium	Os	190.2
Bismuth	Bi	209.00	Oxygen	O	16.0000
Boron	B	10.82	Palladium	Pd	106.7
Bromine	Br	79.916	Phosphorus	P	30.98
Cadmium	Cd	112.41	Platinum	Pt	195.23
Calcium	Ca	40.08	Potassium	K	39.096
Carbon	C	12.010	Praseodymium	Pr	140.92
Cerium	Ce	140.13	Protactinium	Pa	231
Cesium	Cs	132.91	Radium	Ra	226.05
Chlorine	Cl	35.457	Radon	Rn	222
Chromium	Cr	52.01	Rhenium	Re	186.31
Cobalt	Co	58.94	Rhodium	Rh	102.91
Columbium	Cb	92.91	Rubidium	Rb	85.48
Copper	Cu	63.54	Ruthenium	Ru	101.7
Dysprosium	Dy	162.46	Samarium	Sm	150.43
Erbium	Er	167.2	Scandium	Sc	45.10
Europium	Eu	152.0	Selenium	Se	78.96
Fluorine	F	19.00	Silicon	Si	28.06
Gadolinium	Gd	156.9	Silver	Ag	107.880
Gallium	Ga	69.72	Sodium	Na	22.997
Germanium	Ge	72.60	Strontium	Sr	87.63
Gold	Au	197.2	Sulphur	S	32.066
Hafnium	Hf	178.6	Tantalum	Ta	180.88
Helium	He	4.003	Tellurium	Te	127.61
Holmium	Ho	164.94	Terbium	Tb	159.2
Hydrogen	H	1.0080	Thallium	Tl	204.39
Indium	In	114.76	Thorium	Th	232.12
Iodine	I	126.92	Thulium	Tm	169.4
Iridium	Ir	193.1	Tin	Sn	118.70
Iron	Fe	55.85	Titanium	Ti	47.90
Krypton	Kr	83.7	Tungsten	W	183.92
Lanthanum	La	138.92	Uranium	U	238.07
Lead	Pb	207.21	Vanadium	V	50.95
Lithium	Li	6.940	Xenon	Xe	131.3
Lutecium	Lu	174.99	Ytterbium	Yb	173.04
Magnesium	Mg	24.32	Yttrium	Y	88.92
Manganese	Mn	54.93	Zinc	Zn	65.38
Mercury	Hg	200.61	Zirconium	Zr	91.22

INDEX

	PAGE		PAGE
Acetic acid (glacial)	1	Barium hydroxide	43
Acetic anhydride	2	Barium nitrate	44
Acetone	4	Benzaldehyde	45
Acetyl bromide	4	Benzene	46
Acetyl chloride	5	Benzidine	47
Aluminium ammonium sulphate	6	Benzoic acid	48
Aluminium oxide (calcined)	7	α -Benzoin oxime	49
Aluminium potassium sulphate	8	Benzoyl chloride	50
Aluminium sulphate	9	Boiling range tests	xviii
Aminoacetic acid	10	Benzyl iso thiourea hydrochloride	51
Ammonia solution	11	S-Benzylthioureaum chloride	51
Ammonium acetate	13	Beryllium sulphate	51
Ammonium alum	6	Bismuth nitrate	52
Ammonium bicarbonate	14	Borax	228
Ammonium bromide	15	Boric acid	54
Ammonium carbonate	16	Bromine	55
Ammonium chloride	17	Buffer solution chemicals	xvii
Ammonium dichromate	19	n Butyl alcohol	56
Ammonium dihydrogen phosphate	20	iso Butyl alcohol	57
Ammonium fluoride	21	Cadmium acetate	58
Ammonium formate	22	Cadmium chloride	59
Ammonium molybdate	23	Cadmium iodide	61
Ammonium nitrate	24	Cadmium sulphate	62
Ammonium N-nitrosophenylhydroxylamine	85	Cesium chloride	63
Ammonium oxalate	26	Calcium carbonate	64
Ammonium persulphate	27	Calcium chloride (dried)	66
Ammonium phosphate	28	Calcium chloride (hydrated)	67
Ammonium sulphate	29	Calcium sulphate (hydrated)	68
Ammonium sulphide solution	30	Carbon disulphide	69
Ammonium tartrate	31	Carbon tetrachloride	70
Ammonium thiocyanate	32	Ceric ammonium nitrate	71
Ammonium vanadate	33	Chloride, standard opalescence for	291
Amyl acetate	34	Chloride tests	xvi
Amyl alcohol	35	Chloroacetic acid	72
Amyl alcohol (pyridine and nitrogen free)	36	1-Chloro 2,4-dinitrobenzene	73
Amyl nitrate	36	Chloroform	73
Aniline	37	Chrome alum	76
Antimony potassium tartrate	38	Chromium chloride	75
Antimony trichloride	39	Chromium potassium sulphate	76
Arsenic limit test	293	Chromium trioxide	77
Arsenious oxide	40	Citric acid	78
Atomic weights	xvii, 297	Cobalt chloride	79
Barium acetate	41	Cobalt nitrate	81
Barium carbonate	42	Cobalt oxide	82
Barium chloride	43	Cobalt sulphate	83
		Conditions of testing	xix

	PAGE		PAGE
Copper	84	Hydrochloric acid	125
Cupferron	85	Hydrofluoric acid	126
Cupric acetate	86	Hydrogen peroxide (20 volumes)	127
Cupric ammonium chloride	87	Hydrogen peroxide (100 vol- umes)	128
Cupric chloride	88	Hydroxylamine hydrochloride	129
Cupric nitrate	89	8-Hydroxyquinoline	130
Cupric oxide	91	Indicator solutions	288
Cupric sulphate	92	Indigo carmine	131
Cuprous chloride	93	Iodic acid	132
Dextrose	118	Iodine	132
Diethylene dioxide	99	Iodine pentoxide	133
Digitonin	94	Iodine trichloride	134
p-Dimethylaminoazobenzene	97	7-Iodo-8-hydroxyquinoline-5- sulphonic acid	134
p-Dimethylaminobenzaldehyde	95	Iron alum	108
Dimethylaniline	96	Isatin	135
Dimethylglyoxime	96	Lactic acid	135
Dimethyl yellow	97	Lactose	136
3,5-Dinitrobenzoyl chloride	98	Lead	137
2,4-Dinitrophenylhydrazine	98	Lead acetate	138
Dioxan	99	Lead acetate (basic)	139
Diphenylamine	100	Lead dioxide	140
Diphenylbenzidine	100	Lead nitrate	141
m-Diphenylcarbazide	101	Lead oxide	142
Diphenylthiocarbazone	102	Lithium sulphate	143
α , α -Dipyridyl	102	Magnesium acetate	144
Dithione	102	Magnesium ammonium chloride	145
Etchha's mixture	103	Magnesium chloride	147
Ether	103	Magnesium oxide	148
Ethyl acetate	105	Magnesium sulphate	149
Ethyl alcohol (99/100 per cent)	106	Manganese chloride	150
Ethyl alcohol (90 per cent)	107	Manganese sulphate	152
Ethyl crotonacetate	108	Maximum limits of impurities	xv
Explanatory notes	xiv	Melting points	xviii
Ferric ammonium sulphate	108	Mercuric chloride	153
Ferric chloride (hydrated)	109	Mercurous chloride	154
Ferron	134	Mercurous nitrate	155
Ferrous ammonium sulphate	111	Mercury	155
Ferrous sulphate	112	Methyl alcohol	156
Foreword	ix	Methyl orange	157
Formaldehyde solution	114	Methyl red	158
Formic acid (98/100 per cent)	115	Molybdenum trioxide	159
Formic acid (90 per cent)	116	Molybdic acid	159
Freezing points	xviii	α -Naphthol	160
Fusion mixture	116	β -Naphthol	161
D-Glucose	118	α -Naphthylamine	162
Glycerol	119	Nickel chloride	162
Guanidine carbonate	120	Nickel nitrate	164
Heavy metals and iron, standard colours for	292	Nickel sulphate	165
Hydrazine sulphate	121	Nitric acid	166
Hydriodic acid (sp gr 1.94)	122	Nitric acid (fuming)	167
H ₂ diiodic acid (sp gr 1.7)	123	Nitrobenzene	167
H ₂ drobromic acid	124		

	PAGE		PAGE
<i>p</i> -Nitrobenzoyl chloride	168	Reagent solutions	xv, 284
Nitron	169	Residue tests	xvi
Oxalic acid	169	Resorcinol	216
Perchloric acid (72 per cent)	171	Salicylic acid	217
Perchloric acid (60 per cent)	173	Salicylsulphonic acid	260
Petroleum ether	174	Selenium	218
Petroleum ether (free from aromatic hydrocarbons)	174	Semicarbazide hydrochloride	219
<i>o</i> -Phenanthroline	175	Silicate, standard colour for	292
Phenol	176	Silver nitrate	220
Phenolphthalein	176	Silver sulphate	221
Phenylhydrazine hydrochloride	177	Sodium acetate (anhydrous)	222
Phloroglucinol	177	Sodium acetate (hydrated)	222
Phosphate, standard colour for	292	Sodium arsenate	223
Phosphomolybdic acid	178	Sodium bicarbonate	224
Phosphoric acid	179	Sodium bismuthate	226
Phosphorus pentachloride	180	Sodium bisulphate	227
Phosphotungstic acid	181	Sodium borate	228
Picric acid	182	Sodium carbonate (anhydrous)	229
Potassium alum	8	Sodium carbonate (hydrated)	230
Potassium bicarbonate	183	Sodium chloride	231
Potassium bisulphate	184	Sodium citrate	232
Potassium bromate	185	Sodium cobaltinitrite	233
Potassium bromide	186	Sodium diethyldithiocarbamate	234
Potassium carbonate	187	Sodium dihydrogen phosphate	235
Potassium chlorate	189	Sodium hydrogen tartrate	236
Potassium chloride	190	Sodium hydroxide	237
Potassium chromate	191	Sodium nitrate	239
Potassium citrate	192	Sodium nitrite	240
Potassium cyanide	193	Sodium nitroprusside	241
Potassium dichromate	194	Sodium oxalate	241
Potassium dihydrogen phosphate	195	Sodium peroxide	243
Potassium ferricyanide	196	Sodium phosphate (anhydrous)	244
Potassium ferrocyanide	197	Sodium phosphate (hydrated)	245
Potassium hydrogen phthalate	198	Sodium potassium tartrate	246
Potassium hydrogen tartrate	199	Sodium pyrophosphate	247
Potassium hydroxide	200	Sodium selenate	248
Potassium iodate	202	Sodium sulphate (anhydrous)	249
Potassium iodide	203	Sodium sulphate (hydrated)	250
Potassium metabisulphate	204	Sodium sulphide	251
Potassium nitrate	205	Sodium sulphite	252
Potassium oxalate	206	Sodium thiosulphate	253
Potassium periodate	207	Sodium tungstate	253
Potassium permanganate	207	Solubility tests	xvi
Potassium persulphate	208	Soluble starch	255
Potassium sulphate	209	Specific gravities	xvii
Potassium tetroxalate	210	Standard colours for heavy metals and irons	292
Potassium thiocyanate	211	Standard colour for phosphate	292
<i>iso</i> -Propyl alcohol	213	Standard colour for silicate	292
Pyridine	214	Standard opalescence	291
Pyrogallol	215	Standard solutions	289
Quinhydrone	215	Standard turbidity	291
		Stannous chloride	254

	PAGE		PAGE
Starch (soluble)	255	<i>p</i> Toluidine	269
Strontium chloride	256	Trichloroacetic acid	270
Succinic acid	257	Triketohydrindene hydrate	271
Sucrose	258	2,4,6 Trinitrophenol	182
Sulphanilic acid	259	Types of tests	xiv
Sulphate standard turbidity for	291	Uranyl acetate	272
Sulphosalicylic acid	260	Uranyl nitrate	273
Sulphuric acid	261	Urea	275
Tartaric acid	262	Vanillin	276
Telluric acid	263	Volumetric standards	xvi
Temperatures	xvii	Water (redistilled)	276
Thallium sulphate	264	Zinc	278
Thorium nitrate	265	Zinc acetate	279
Time for tests	xi	Zinc oxide	280
Tin	265	Zinc powder	282
Titanyl potassium oxalate	267	Zinc sulphate	282
<i>o</i> Toluidine	260		